

APRIL 1958

OUR SPY IN OUTER SPACE

35 CENTS

# POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT



*Build This  
All-Purpose  
Electric Cart  
—Page 166*

Read What the Owners Report About

**CHEVROLET, FORD  
and PLYMOUTH**

*15 Pages on Outdoor Living*

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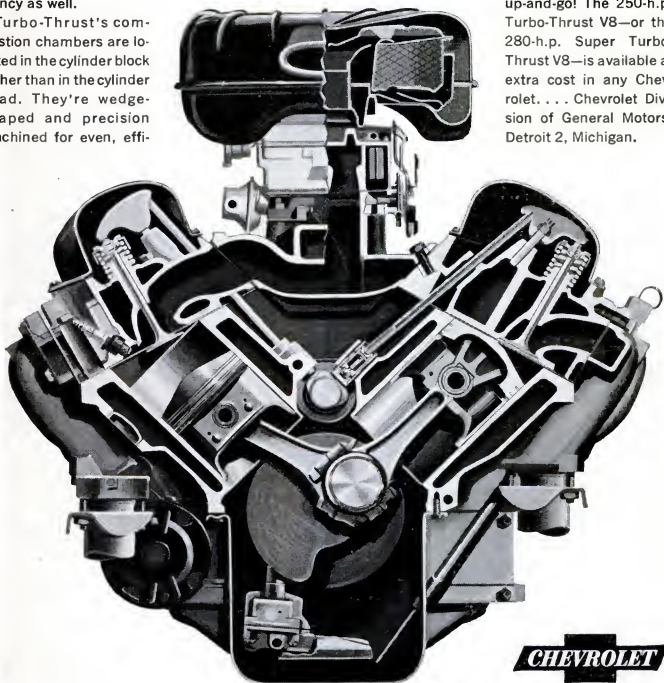
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**CHEVROLET**

APRIL 1958

This One



E9B0-F4J-NZ75



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*\*Blankety-blank, that is!*

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## In This Issue...

Our Spy in Outer Space	81
How to Stay Alive on Mountain Highways	88
The Jet Stream Is the Villain	96
Owners Report on Ford, Chevrolet and Plymouth	102
Quick Power When Disaster Strikes	109
It's Moving Day!	121
Push a Button and You Make Beef	134
"K" Rations for the Zoo	140

## OUTDOOR-LIVING SECTION—

We Built a Family Room Outdoors	144
Patios in the Sky	150
Outdoor Living on a 20-Foot Lot	152
Three Pools for Small Lots	154
A Yard Is for Fun	156
Radio, TV and Electronics	159

## For the Craftsman...

Attracting Songbirds to Your Garden	163
Golf Cart—or Family Runabout—Part I	166
Bozo, the Puppet—Part I	178
Swish—a 15-ft. Sports Runabout—Part I	188
Buying a Used Camera	200
How to Cut Lap Joints	207

## Regular Departments...

Detroit Listening Post	100	On the Market	199
What's New for Your Home	126	Shopping for Tools	218
Solving Home Problems	176	Clinic for Homemakers	228

Turn to detailed index on page 74. Sources of additional information on items in this issue are shown on the Where-to-Find-It List, available without charge by writing the Bureau of Information, Popular Mechanics, 200 E. Ontario St., Chicago 11, Ill.

## Next Month...

CAMPERS ARE taking to the by-ways by the millions these days. Can an average family have fun camping? How much will it cost? What equipment is required? To learn the answers to these questions, we sent a family on a 7500-mile camping tour. The first of two articles on their joys and headaches will appear in May





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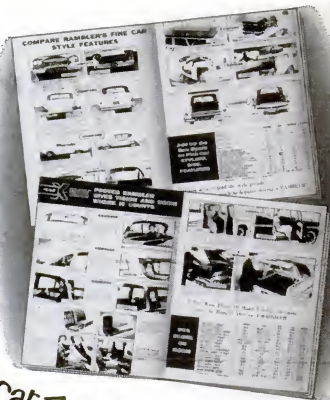


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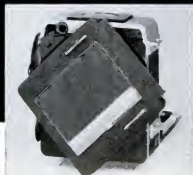


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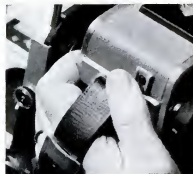
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## ACROSS THE DESK



### Avalanche of Letters

Letters by the thousands have poured in to our Bureau of Information requesting reprints of the "Significant Sixteen" autos reproduced in color in the special automotive section of the February issue. The



letters came from every state in the union and from many foreign countries. Additional reprints are now off the press and available. Requests should be accompanied by 25 cents in coin and addressed to Bureau of Information, *Popular Mechanics*, 200 East Ontario St., Chicago 11.

Here are samplings from the letters:

How could your experts overlook the Duesenberg? Four-wheel hydraulic brakes alone make it significant. . . .

Calvin D. Morehart,  
Columbus, Ohio

★

As a collector of antique automobiles and an officer (Ed. NOTE: *He's president.*) of the Minneapolis Region of the Horseless Carriage Club of America, I would like to submit my own list of great automobiles: 1893 Duryea, 1896 Ford, 1901 Oldsmobile, 1903 Ford, 1904 Buick, 1905 Packard, 1906 Orient Buckboard, 1908 Thomas Flyer, 1909 Ford Model T, 1912 Cadillac, 1912 Locomobile, 1915 Cadillac, 1915 Dodge, 1919 Ford, 1925 Chrysler, 1926 Chevrolet, 1928 Ford, 1929 Cadillac, 1930 Packard, 1932 Lincoln, 1932 Ford Model 18, 1933 Chevrolet, 1934 Chrysler Airflow, 1935 Ford, 1937 Oldsmobile, 1939 Lincoln Continental, 1941 Packard, 1944 Willys Jeep, 1947 Studebaker, 1948 Tucker, 1949 Ford, 1955

(Continued to page 8)



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(Continued from page 6)

Chevrolet, 1956 Continental, 1958 Rambler American.

David J. Leipold,  
Minneapolis, Minn.

Especially would I like the reprints since my brother was the artist. . . .

Mrs. William Lowell White,  
Camp Verde, Ariz.

As a collector of old cars I would like to frame the reprints to hang in our small museum. . . .

G. Nelson Pfundt,  
Georgana Farms,  
Bucks County, Pa.

Auto issue this year is outstanding. . . .

Harley D. Mitchell,  
Temple, Tex.

Haven't missed an issue in many years.

John H. Heintz,  
City Manager,  
Franklin, Ohio

Too many of our youth of today fail to realize the struggle of the early automobile men to produce and market a car. Perhaps this will show them that nothing really new and startling has been accomplished in quite a few years in the auto business.

Mark Williams,  
Henderson County High School,  
Henderson, Ky.

Thought the cars were beautiful but should have included the Stutz and Mercer.

Michael Radakovich,  
Huntington Park, Calif.

A salute to you for the accuracy of the color illustrations of early model cars, February number. Only one slight oversight: the dos-a-dos seat of 1902 Oldsmobile should have two rods supporting footrest.

Hi Sibley,  
Nuevo, Calif.

... concerning one car not listed—Maxwell by Brisco . . . was the first with thermosiphon cooling for water and three-point motor suspension. . . .

George A. Ferrell,  
Binghamton, N. Y.

... bring back a lot of memories. I started as a driver in New York in 1907.

William G. Strawbridge,  
Boca Raton, Fla.

(Continued to page 10)



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(Continued from page 8)

The pupils in my class at the Rawson School are studying the development of the automobile. I am sure they will benefit from the pictures. . . .

Yvonne M. Bellerose,  
Hartford, Conn.

☆

I am a high school auto-mechanics instructor and will use these in discussing the history of our American automobiles.

Jack A. De Angelis,  
Los Angeles, Calif.

☆

I happen to own one of the Chrysler Airflows 1934 and its cruising speed of 90 m.p.h. or better with gas consumption of 19 m.p.g. leaves one to wonder where the improvements are in today's crazy wrap-around sweat boxes. . . .

O. L. Hinger,  
El Paso, Tex.

☆ ☆ ☆

#### Award Winner

One of the houses featured in the PM Parade of Homes (*Popular Mechanics*, October 1957) won a coveted National Association of Home Builders' 1958 Design Merit Award. The house was designed by Francis D. Lethbridge, A.I.A., of Keyes and Lethbridge, Washington, D.C., and was

built by the Bennett Construction Company in a suburb of Bethesda, Md.

☆

#### Hitting Below the Beltline

After studying your "Dictionary of the Automobile Stylist" I believe I am now tuned in to give my opinion of the 1958 products of the Ivory Towers, who have been striving so hard for ipsipipsi and spooky automobiles.

In their attempts to design something gutty and gasarooney, they have pizazzed the whole thing and made it hairy, goo-goo and gorpod up.

Much as I need a new car, I refuse to trade my '51 model for one of these gorky things with spaghetti from fireplace to telephone pole. Let's hope the stylists sweeten their designs and leave off the stinkie.

Bob Ingle, Jr.,  
Macon, Ga.

ED. NOTE: For those of you who missed the dictionary (Feb. 172-3) here are a few definitions to help you translate the above: Ipsipipsi, correct proportions; spooky, futuristic; gutty, powerful; gasarooney, terrific; pizazz, give it everything; hairy and goo-goo, overdone; gorpod up and gorky, out of shape; spaghetti, too many moldings; fireplace, grille; telephone pole, molding below taillight; stinkie, glitter.

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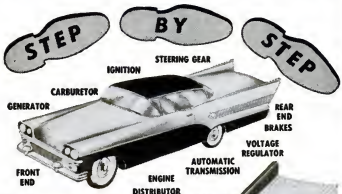
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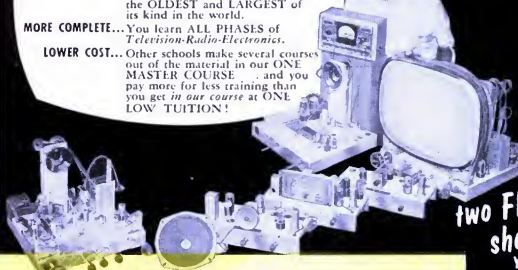
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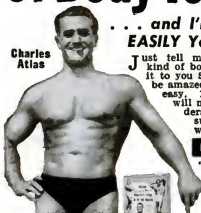
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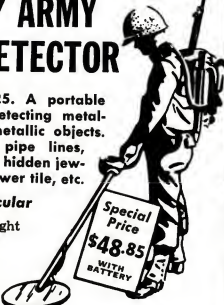
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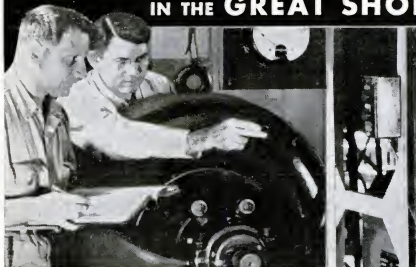
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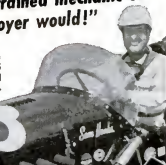
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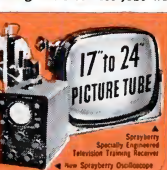
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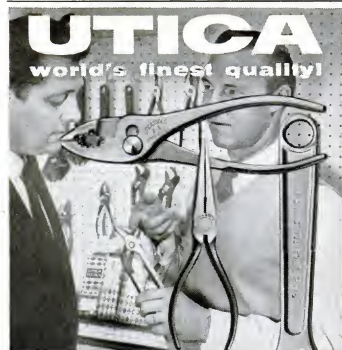
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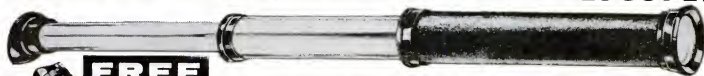
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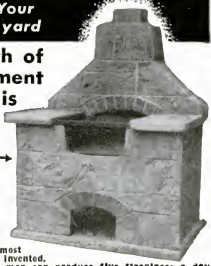
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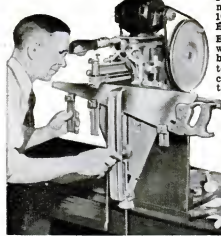
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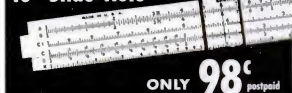
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AMAZING NEW "Tom Thumb" Home Adding Machine guaranteed to accurate as office machines costing \$100.00, yet all you pay is \$1.98. Not a toy, not a gadget, but a precision-engineered American-made machine that NEVER MAKES A MISTAKE! You dial your number—and read your answer instantly, automatically! Add mountains of numbers, page after page of figures in mere MINUTES while others take HOURS! No guesswork, no double-checking, no pencil-chewing, no erasures, no "starting all over," no costly human mistakes that may mean MONEY OUT OF YOUR POCKET! This machine is 100% accurate—and it's guaranteed accurate for 10 years or FREE replacement! It saves you time, work, money and needless mental aggravation and frazzled nerves! Use this amazing machine day after day: Check bills, statements, purchases. Use for INCOME TAX RETURNS! Keep running tab of food purchases at super-markets (You always know how much you've spent—before you reach check-out counter!). Keep score in card games, golf, all sports. Check children's homework. Indispensable for fast, fingertip computing! Machine is UNBREAKABLE in normal use. Never needs repairs, adjustments or lubrication. No loose parts. Fits pocket or purse. Comes complete with stylus—ready to use. Handsomely boxed. No. 116, \$1.98.

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**Gear Operated  
Like \$100.00  
Office Machines!**

This "Tom Thumb" model is completely different from old-style, long-column type adding machines that require complicated, time-consuming "over-loop" action everytime you go over "9's". Those machines are NOT gear-operated; therefore not fully automatic! This model has synchronized meshing gears that automatically turn digits to right totals with lightning speed! No pushing up or down, no searching for figures! No wonder Independent Consumer Testing proves this model "A-1"—the BEST! THORESEN'S, 585 Water Street, New York 2, N. Y.

THORESEN, Inc., Dept. 6-D-116  
585 Water Street, New York 2, N.Y.

Rush Adding Machine checked below. My money back if I'm not satisfied.

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☐ No. 116-D DeLuxe Model \$2.98

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FREE! Our \$1.25 Slide Rule & Book FREE on prepaid order for our \$3.98 Adding Machine. Keep Slide Rule FREE in any case!

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ADDRESS \_\_\_\_\_

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**FOR EASY DRIVING, ALL WOOD SCREWS ARE SPEEDIZED**

An invisible lubricating film on "STOCK your SHOP" Wood Screws makes them easy to drive in even the hardest woods! This free extra feature eliminates bent and broken screws, prevents sore and aching hands. Ask for "STOCK your SHOP" the next time you buy screws.

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**EASY TO  
GET OUT!**

**59¢ PER BOX**



LOOK FOR THIS SELF-SERVE DISPLAY AT YOUR STORE

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**Remington Mighty-Mite® Stud Driver** is a cost- and time-saving fastening tool with a hundred uses! One light hammer tap on firing pin permanently anchors furring strips, partition plates, electrical outlets to concrete or steel with special Remington Studs. Scientifically graded 22 caliber Power Loads furnish *exact* driving force needed. No pre-drilling. See your dealer today or send coupon for full details. **Only \$39.95**

*Most dealers also have a tool-rental plan.*

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**UNSCREW** upper assembly, drop a Remington "Power-Guide" Stud into barrel, insert chamber bushing and proper 22 caliber Power Load.



**REPLACE** handle-grip assembly, position tool and press firmly over work. Tap firing pin with a light hammer and the job's done!

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## STOP OIL BURNING

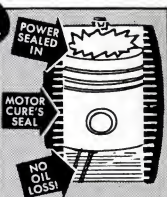
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**\$1.95**  
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This beautiful lantern unit is adjustable to heights up to 7' 4". Comes in complete package with adjustable steel lamp post; name plate arm; black painted aluminum lantern with glass windows and solid brass top ornament.

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## New car pick-up gone?...call for HASTINGS

That loss of pep and power is one of the first signs of worn-out piston rings. Costly wastage of oil and gas starts mounting up... and ends up with costly repairs later on.

See your motor specialist the minute oil-pumping warns you there's trouble ahead. When he recommends new piston rings, ask for Hastings. They're engineered exclusively

for replacement service... to stop oil-pumping, save gasoline, restore lost performance.

Get new car performance from your present car—with Hastings. Truly your best investment for thousands of extra miles of trouble-free driving. Hastings Manufacturing Company, Hastings, Mich. Piston Rings, Comite, Wear Reducer, Oil Filters, Spark Plugs

U. S. PATENT NOS. 2614899, 2712971

**TOUGH ON OIL-PUMPING  
GENTLE ON CYLINDER WALLS**



# HASTINGS

**PISTON  
RINGS**



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Prepares the toughest soils in one operation. All-purpose tiller-tractor tills to 12" deep —12" to 40" wide. 3 models; 7 rotor styles including mulchers. 40 attachments include all tractor tools, mowers, snow plow. Tough chain-gear drive. Send for details.



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advertised in PM



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## RELIABLE

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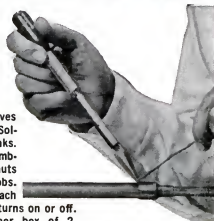
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**\$1.95**  
with charger

Butane gas blow torch gives intense 3500° flame. Solders, brazes, fixes leaks. Perfect for wiring, plumbing, loosening frozen nuts and bolts, 1001 odd jobs. Carry in your pocket. Each charger lasts ½ hour, turns on or off. Extra chargers, 49¢ per box of 2.

Get Jet King Butane Blow Torch at hardware stores. Or, send check or money order, we pay postage. For \$1 more (total \$2.95), get Soldering Kit; torch, tip, 3 feet cored solder, extra charger. Good for TV, radio, jewelry.



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Send me ☐ Boxes of Extra Chargers @ .49 per box.

My check,  money order  for \$  is enclosed

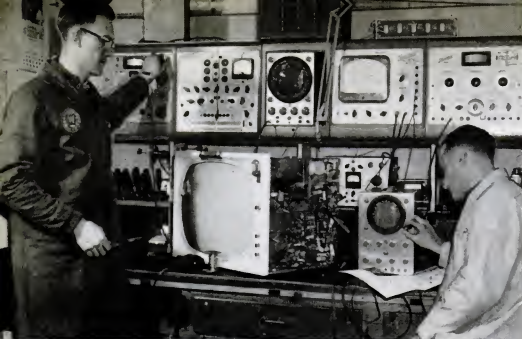
NAME

STREET

CITY

STATE





J.N.E. Television, E. Chicago, Ind.

Analyze, locate, repair and adjust are the steps followed in television servicing. The tools of this trade are instruments such as oscilloscope, signal generator, vacuum tube ohmmeter, tube tester and sweep generator. Here, technicians are checking the alignment of a set using some of this equipment.

### CAREER SERIES THREE

**SKILLS  
for  
AMERICA**

# TELEVISION — RADIO — ELECTRONICS

## Field of Skill and Opportunity

Today, the interest of the entire world is focused upon this great industry. It is the basis of entertainment in our homes; it is vital in advertising, public relations and the split-second communication of news and current events. In community service: Police and fire, traffic control, dial and long-distance telephone, and a host of other similar applications, it has become essential.

Then, on a larger scale, you might say the very peace of the world hinges on electronics. Radar was one of the deciding factors in the outcome of World War II. The first atomic explosion was seen on an oscilloscope screen. In man's conquest of space, electronics is undoubtedly the most important factor.

The potential for the further development and application of electronics is tremendous! This is one of the fastest growing, most dynamic of all industries and should be considered by every young man when planning his career. The opportunities for interesting, good paying jobs with real advancement possibilities in sales and service, in manufacturing, and in research are as unlimited as the future of electronics itself!

### Radio-Television Repairmen Are Wanted!

Due to the universal use of radio and television, and the phenomenal rate of manufacture and sales of new sets, the number of qualified radio-TV repairmen available today has fallen behind the volume of repair work required to keep millions of sets in good working order. This shortage of repairmen has created un-

matched opportunities for men interested in becoming radio-TV technicians.

In the opinion of educators and businessmen, the opportunities that exist today for technicians will continue far into the future. And for the man who will really make the effort to qualify himself, they exist regardless of general employment conditions. The qualified technician is needed now—and will be needed for unpredictable years ahead.

The earning possibilities for technicians depend upon the individual. Those interested in making a living, and a little more, can do so without difficulty. Those determined to rise higher to succeed can. A radio-TV repair business of your own is well within the reach of the qualified technician, and for little more than \$1500. The opportunity is there for those having the ambition and drive to take advantage of it. However, success depends on you, your training, your service, and customer relations.

### Training and Education a First Essential

Radio-TV servicemen are highly skilled specialists. They must be thoroughly familiar with the theory of reception. They must analyze circuit malfunctions by use of electronic test instruments, and must make necessary component replacement and repairs. To service color television, the printed circuit-transistor receiver and other advanced applications of electronics requires specialized knowledge. Careful technical training and education are fundamental to success in the exciting field of electronics.





"As distributors of electronic supplies, we deal with service technicians, engineers, ham operators, hi-fi enthusiasts, experimenters, and hobbyists. To service these customers to their satisfaction, our parts salesmen, countermen and store managers must have a broad understanding of radio, television and electronics. Our company recommends that all sales personnel have technical training. I am manager of three Olson stores in the Chicago-Milwaukee area. The trade school education I received has been one of the greatest aids in my work. Without it, I wouldn't be in my position of responsibility!" Charles F. Kellner, Chicago Manager, Olson Radio Warehouse.

"The television repairman has to know almost as much as the designer to service sets properly. This takes study! Our requirements for new men are 2-4 years of trade school training. Our experienced technicians spend one to two weeks each year taking trade courses to keep abreast of electronic improvements. Trade schools have certainly earned my respect! I'm a graduate of one, so are my son and son-in-law. Fact is, the success of our business is due to our trade school background." J. N. Eismann, Owner (right); J. N. Eismann, Jr., J.N.E. Television, East Chicago, Ind.

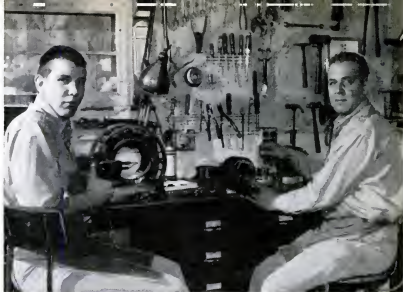
### Required Training Available

The means of securing the training necessary to qualify as a top rate technician is readily at hand. No man who is willing to work hard need pass up his opportunity because of lack of training. There are many excellent resident technical schools and home study schools that will provide you with the authoritative training you must have for a technical career.

Many of these technical schools may be found in the pages of *Popular Mechanics*. The training they give will enable you to rise, with a little experience, to the supervisory level. Then, with continued study and application, you should be able to reach almost any goal you set for yourself.

Throughout the width and breadth of modern industry are men in all types of positions—executive and administrative as well as shop and laboratory—who got their start through technical and trade schools. The electronic field is gigantic in size and manifold in application; it is expanding to unimaginable horizons. The opportunity is there—the training is available. Take advantage of it, and develop for yourself a skill and a future in television, radio and electronics. Do your part to develop

**SKILLS for AMERICA**



"No man can be truly competent in technical fields without thorough training—the kind you get through trade courses. My son and I both graduated from an electronic trade school. The thorough instruction I received made it possible for me to start my own business. The technical education my son received gave him an immediate advantage when he joined the Marine Reserve. Our firm rebuilds and repairs electric motors, generators and appliances. There is a lot of business in this field—but only for the skilled and trained." Alfred H. Laseke, Owner (right); Alfred H. Laseke, Jr., Laseke Electric Co., Palatine, Ill.



"Electronics is a growing, thriving industry with a great future. Men with technical ability are in demand. We are employing twice the number of technicians today as in 1950. Most of these have come from trade schools. The graduate of a good trade school has the training necessary to get a rewarding job in electronics. Thereafter, advancement will come according to his ambition and energy. I must emphasize the need for technical education. It's fundamental to success. For instance, without my trade school education, I'm sure I wouldn't have my present job." Roy S. Laird, Vice President, Ohmrite Mfg. Co.



# Cut it with WISS



Cut Metal, Vinyl, Leather—practically anything—with versatile WISS V-13 "Mighty Midget" Snips. Only 7" long, \$2.25. Others 8" to 17" in aviation, combination, and solid steel styles. At hardware and department stores.

## OTHER FINE WISS CUTTING TOOLS

**GRASS SHEARS**  
No. 701  
\$2.75



Easiest cutting, fastest cutting grass shears you've ever used, with molded vinyl handle grips and special closing latch. Others from \$1.29 to \$4.95.

**PRUNERS**  
No. 908  
\$3.25



WISS Hy-Power Pruners cut the toughest limbs with ease. No. 908 (illustrated) 8" long, \$3.25. No. 907, 7" long, \$2.95. Wherever garden tools are sold.

**J. WISS & SONS CO., NEWARK 7, N. J.**

World's Largest Manufacturer of Shears, Scissors, Pinking Shears, Skalloping Shears, Metal Cutting Snips and Garden Shears

## WHERE-TO-BUY-IT INDEX

Source of supply appears after items commercially available

### AUTOMOTIVE

Here it is—T.V. for cars.....	93
Detroit Listening Post.....	100
Car tent (Camp Craft Corp., Melvindale, Mich.).....	113
French-built coupe has Chrysler V8 engine (The Hoffman Motor Car Co., 443 Park Ave., New York City).....	117
Berkley sports car now has hardtop model (B.C.S. Corp., 566 Whalley Ave., New Haven, Conn.).....	120
Car-engine tool becomes supersensitive heart-murmur detector.....	125
Briton solves parking problem by moving big car sideways.....	132
Italian solution is pint-size car.....	132
Mobile overpass speeds servicing.....	132
Junker made into inexpensive weather-tight camping trailer.....	133
Finns' small car weighs 620 pounds.....	133
Tiny German car goes together like a frankfurter roll.....	133

### AVIATION

Amphibious helicopter rides outrigger floats.....	101
Swedish air force has rocket-powered missiles.....	112
Do-it-yourself airplane carries six passengers.....	117
Builder flies full-scale model of 1917 German fighter.....	120
Copters retrieve targets (Ryan Aeronautical Co., Lindbergh Field, San Diego 12, Calif.).....	124
Pilots watch blind spots with TV.....	139

### BOATING AND FISHING

Barnacles get the heave ho.....	124
Landing craft pushes self off beach.....	125
Skin diver-miners vacuum for gold.....	138

### CONSTRUCTION

Zurich plans parking lot for 500 cars under Limmat River... 94	
They built a dam like a road.....	116
French town builds city hall with ice-cream-cone design.....	117
Berlin's open-air restaurant heated for year-round use.....	138

### HOUSE AND HOME

Portable aluminum torches make patio parties brighter (John Charles Copperware, John Charles Building, Torrance, Calif.).....	129
Patios in the sky.....	150
Outdoor living on a 20-foot lot.....	152
Three pools for small lots.....	154
A yard is for fun.....	156
Screens for pools or patios.....	158

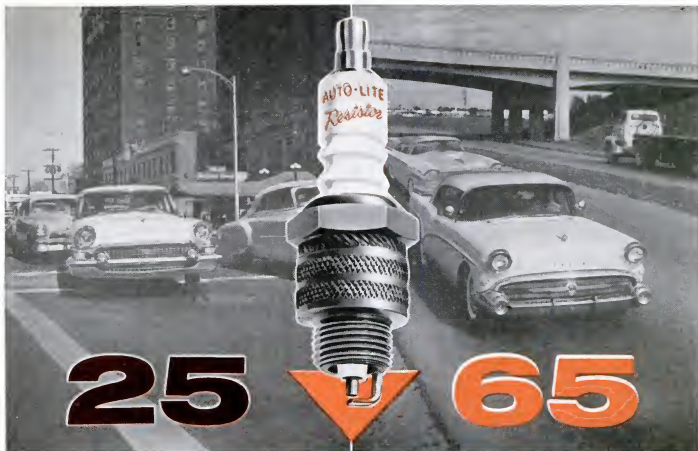
### MISCELLANEOUS

Trampoline diving board suits big or small pools (Nissen Trampoline Co., 215 A Avenue N.W., Cedar Rapids, Iowa).....	95
California race track uses big blower to dry up muddy spots.....	101
Stretchable paper prevents tearing of bags when under strain.....	112
Roll of punched tape runs automatic welder.....	120
They see drive-in movies from their own home.....	128
Stream of air powers electrostatic filter in air conditioner.....	129
Milk by the chunk served Canadian army.....	129
Sportsman's cabin.....	137
Teen-agers set up a phone system.....	143
All-transistor metal detector uses 1500-hour batteries (Fisher Research Lab. Inc., 1961 University Ave., Palo Alto, Calif.).....	272

### SCIENCE

Chemical protects bees from insecticide poisoning.....	78
Dustfree workers make missile "brains".....	93
All-transistor portable TV.....	112
Army's giant "power drill" uses nine-foot-wide bits.....	112
Magnets can cook food without direct heat.....	138
Wire coated with aluminum promises longer service.....	138

(Continued to page 76)



**IN TOWN TRAFFIC . . .** some spark plugs, designed for high speeds, become fouled and cause misfiring and loss of power when driven at low speeds.

**ON THE HIGHWAY . . .** some spark plugs, designed for low speeds, misfire causing power loss and invite destructive pre-ignition when driven at high speeds. Why gamble when . . .

## Auto-Lite Resistor Spark Plugs with **POWER TIP** "Fire Up" your engine\* at all speeds!



If you drive at both town-traffic and highway speeds, here's why you should use Power Tip . . . the first spark plug ignition-engineered for today's engines and today's driving.

At low speeds, the projecting Power Tip is in the thick of combustion where it gets hot quicker and stays hot to burn fouling deposits away *clean*. At higher speeds, the projecting tip is in the path of the incoming air-fuel mixture where it stays cooler to effectively *check* power-robbing pre-ignition. Ask your garage or service station to install Auto-Lite . . . the *only* spark plugs with Power Tip . . . and start enjoying top performance and economy from your car at *all speeds*.

\*Power Tip, with or without Resistor, is ignition-engineered for overhead-valve V-8 engines and for most overhead-valve 6-cylinder engines in all these cars—Buick, Cadillac, Chevrolet, Chrysler, De Soto, Dodge, Edsel, Ford, Hudson, Imperial, Lincoln, Mercury, Oldsmobile, Nash, Packard, Plymouth, Pontiac, Rambler, Studebaker.

YOU CAN SEE  
THE BIG NEW  
DIFFERENCE IN  
SPARK PLUGS!



Ordinary Tip      Power Tip

Power Tip protrudes farther into the combustion chamber for better ignition. Fuel burns more evenly and completely to give top performance and economy at *all speeds*.

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**PLASTIC ALUMINUM**  
in the big 5½ oz. Tube



USE **DURO** handy-patch  
THE SELF-SOLDERING PATCH

**For Repairing Large  
Rusted Out Areas  
COMPLETE KIT . . . .**

**EASY TO USE    CUT    DIP    PATCH**



Chemically vulcanizes without tools, heat or flame to repair most ANYTHING made of rubber or canvas. Molds to any shape. Waterproofs, rustproofs, insulates, repairs and caulks.

Large 4 fld. oz. tube in black or white.... **\$1<sup>00</sup>**

Buy these 3 fine DURO products at all better hardware, auto accessory, paint and variety stores. If not available, write:

**WOODHILL CHEMICAL MFG. CO.**

1395 EAST 33rd STREET

Is Wonderful!

Testimonials from all over the country prove DURO Plastic Aluminum's ability to perform hundreds of fix-it wonders. Use it in your home, auto, boat and shop. DURO Plastic Aluminum, the original metal in putty form, in the big 5½ oz. tube, only

**\$100**

(Continued from page 74)

## WHAT'S NEW FOR YOUR HOME

Portable water softener attached to any faucet.....	126
Stepcladder grips guard against accidents.....	126
Serving frame stretches to fit dishes.....	126
Electric griddle.....	127
Spring door electrical box protects outlet from elements.....	127
Spillproof plastic cup for children.....	127
Home barbering aid fastens to scissors.....	127
Electric door mat brushes dirt from shoe soles.....	127

## Craftsman and Shop Notes Index

## LAWN AND GARDEN

Protect plants from cutworms.....	174
Old farm milk cart serves as portable garden planter.....	174
Store garden hose in basket.....	174
Temporary fences held against stakes by staples and wire....	196
Carpentering used as tree mulch.....	206

## HOUSE AND HOME

Tinted caulking compound.....	174
Plant rack clamps on porch rail.....	174
Home target range.....	175
Repairing cracks in plaster.....	196
Sticking sash easily removed.....	214

### MISCELLANEOUS

Insulated home for your dog.....	172
Aluminum-foil lining in grill fire pan reflects heat to grid.....	174
Drawer serves as writing desk.....	185
Sharpen sewing-machine needle.....	185
Portable sunshade for dog.....	196
Garden hose on wire fence eliminates need for gate.....	198
Flameless charcoal igniter made from range element.....	198
Coupling implement from tractor seat.....	212
Pickup box mounts on tractor.....	212
Watch and matches kept dry in jar while boating.....	213
Preventing spilled water from staining rug.....	213
Handy lifter for pickup arm.....	214
Rubber bands save old broom.....	214

## ON THE MARKET

Plastic forms for casting building stone.....	199
Flexible doorstep .....	199
Waterproof compound .....	199
Roll-on adhesive .....	199

### OFFICE, SHOP AND STORE

Bracket keeps ink bottle level.....	171
Cards duplicated on stamp pad.....	193
Washing of store windows simplified by perforated tubing..	197
Handy memo pad attached to wall-mounted telephone.....	206

## PHOTOGRAPHY

Sponge keeps print paper flat.....	193
Bracket holds extra lights for shadow-free photographs.....	197
Camera tripod hung on eyebolt.....	198

## SHOPPING FOR TOOLS

Adjustable stop for repeat cuts on radial saw.....	218
One-piece anchor for masonry.....	218

(Continued to page 78)

**NOTICE**—It is the intention of this magazine to provide its readers with information regarding the latest developments in the mechanical arts. Except where otherwise indicated, this magazine has no information as to any unexpired patents in respect of the developments reported herein, and it is not intended to be construed as an admission of the developments reported herein. It is suggested that legal counsel be consulted to avoid liability for patent infringement. It is not the purpose of this magazine to encourage patent infringement but, as a service to its readers, it is intended that this magazine to report on the latest developments in the mechanical arts.



Read what users say about

# DURO<sup>®</sup> PLASTIC ALUMINUM

Here's a home repair kit in a tube

What do fix-it-yourself people have to say about Duro Plastic Aluminum? According to the mail, it's like having a handyman around the house. Metal in putty form, Duro Aluminum seals, solders, repairs—adheres to virtually any surface.

Made with ALCOA<sup>®</sup> Aluminum Powders by Woodhill Chemical Co., Cleveland, Ohio, Duro Plastic Aluminum is applied like paste, dries metal-hard in three hours. Users write that it fixes anything. Here's a sampling from their letters:

**WISCONSIN MOTORIST:** "... fender had rusted through ... used Duro Plastic Aluminum ... worked perfectly ... can't see where the hole was."

**NEW YORK HOMEOWNER:** "... fixed all my gutters and leaders with no effort ... just spread it on and let dry ... Duro is wonderful."

**WISCONSIN MAN:** "... repaired storm windows, toys; patched screens; filled in counter-sunk screws in a boat ... I'll never be without Duro Plastic Aluminum."

**NEW JERSEY MOTHER:** "No amount of glue or even nails would hold my 3-year-old's playpen together ... Duro made it good as new."

**SEATTLE NOMAD:** "... waterproofed the seams of our house trailer ... very easy to apply ... not a leak since."

**NEW YORK HOUSEWIFE:** "I have an antique pewter-and-brass urn that no fix-it shop could repair ... Duro did the trick."

**CALIFORNIA MOTORIST:** "Duro sealed my radiator after a fan blade went through it ... saved a \$15-\$20 charge at a radiator shop."

**SAVE MONEY... FIX IT YOURSELF**

**DURO<sup>®</sup>** The Original **PLASTIC ALUMINUM**

**HUNDREDS OF USES FOR THIS AMAZING METAL IN PUTTY FORM!**

**"The Family Handyman"**

Applied Cold, Hardens into Metal

**\$1.00** LARGE 5oz. TUBE

**SEALS • SOLDERS • REPAIRS**  
Not a Cement—Not a Glue  
ANYONE CAN USE IT!

**ALCOA ALUMINUM**

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(Continued from page 76)

Portable jigsaw .....	218
Two-line stripping tool .....	218
Electrothermal unit .....	219
Hydraulic scaffold .....	219
Mason's line clip .....	219
Power hacksaw blade .....	219
Air-current direction finder .....	220
Pistol-grip handle .....	220
Plunger-actuated oiler .....	220
Pneumatic oiler .....	220
Selflocking clamp .....	220

## SOLVING HOME PROBLEMS

Two-vegetable "double boiler" .....	176
Center support for clothesline .....	176
Pair of embroidery hoops hold bag open .....	176
Dents in inlaid linoleum .....	176
Hang miscellaneous kitchen items .....	177
Cabinet for canned goods .....	177
"Sprinkling can" for house plants .....	177
Lift-out partitions in cabinet drawers .....	177
Premium stamps won't stick together .....	177

## WORKSHOP HINTS

"Marproofing" pliers jaws .....	171
Jig for straightening tubing .....	171
Loose bristles easily removed from paintbrush .....	185
Locking worn nut on bolt .....	198
Panels "jointed" with saw .....	198
Steel wool reinforces cement .....	198
Straw sections mark wires .....	206
"Haircut" for paintbrushes .....	206
Sponge oils overhead pulley .....	206
"Custom made" wrecking bar .....	206
Steel ball sets hollow rivet .....	211
Thumbtack tightens cover .....	211
Keep soldering iron clean .....	211
Thin splines for miter joints .....	211
Emergency door bolt from leaves of butt hinge .....	213
Screw-hole plugs made from dowels .....	213

## Beware of Lunar Uranium Stock

Don't buy stock in a uranium mine on the moon. That's the advice of Dr. Lyle B. Borst of New York University, whose studies indicate there is about one percent as much uranium on the moon as on earth. He also reports that there's "air" on the moon, but the atmosphere is so thin it is about equivalent to the best laboratory vacuum. The air contains only two heavy gases, krypton and xenon.

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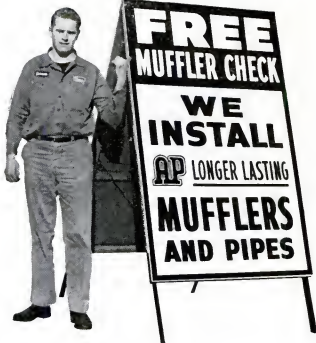
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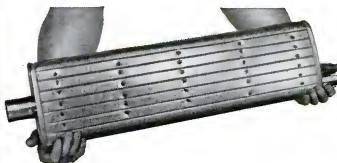
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## Bank Gives Big Lift To Small Depositors

Designed to encourage youngsters to keep their money in a bank account, a hydraulic lift has been installed at the First National Bank of Geneva, Ill. The elevator retracts flush with the floor when adults are using the counter. But the lift adds 12 inches to the height of young depositors.

## Control Device Aids Eye Surgery

Delicate eye operations with electrosurgical equipment can be performed with less chance of tissue burning with a new control device. The instrument permits the surgeon to control both voltage and frequency of the "electrical knife" which cauterizes as it cuts. The instrument will aid surgeons in operations to correct detached retinas and similar eye defects.

## Scientists Seek Computer To Design and Make Parts

Electronic "brains" may soon be part of an automatic tool system that designs an item and then produces it. Massachusetts Institute of Technology is now engaged in research leading to such an automatic "design machine." The major obstacle has been that of working out proper instructions.



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# EXPLORER III

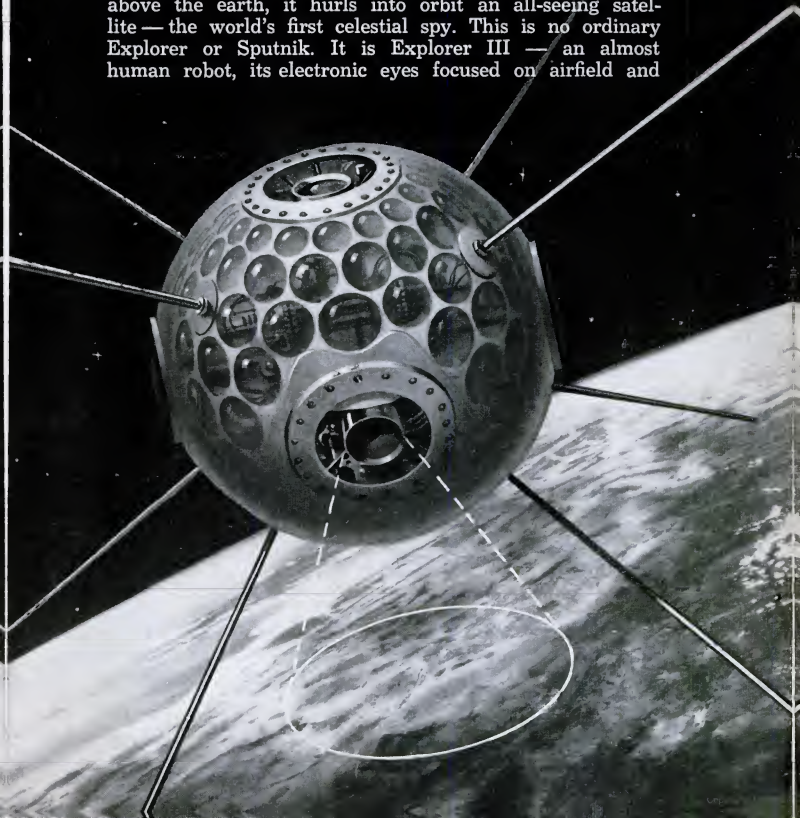
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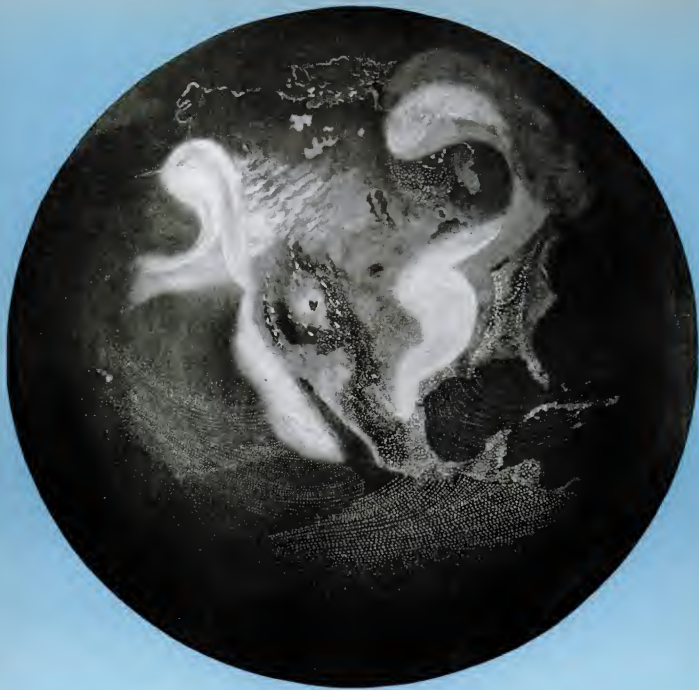
WRITTEN SO YOU CAN UNDERSTAND IT  
VOL. 109 NO. 4

## OUR SPY IN OUTER SPACE

*By James Joseph*

**F**ROM ITS SECRET launching pad, a multistage rocket screams toward space. Minutes later and 1000 miles above the earth, it hurls into orbit an all-seeing satellite—the world's first celestial spy. This is no ordinary Explorer or Sputnik. It is Explorer III—an almost human robot, its electronic eyes focused on airfield and





This is how the earth and cloud systems might appear in TV picture from satellite 4000 miles above Texas

factory—and perhaps, on your own back yard. It is a spy, moreover, scheduled for launching within the next 24 months—sometime before 1960.

Orbiting at 16,000 miles per hour, Explorer III swings high above the pole, its course—a north-to-south polar path—calculated to carry it once around the world every 105 minutes. And with each circling it surveys yet another earth sector, thus keeping the whole world under daily surveillance.

According to present plans, the Army will launch Explorer III with a ballistic missile the same as the Redstone used to launch Explorer I on January 31, and the predicted Explorer II. These “moons” are expected to pave the way to manned space stations. The Explorer III will weigh

about 300 pounds and will be equipped with television cameras. Also in the planning stage is Explorer IV which will carry elaborate electronic equipment in addition to the cameras. The primary purpose of Explorer IV will be to gather detailed data needed for the construction of a space station. In order to launch the heavier satellites, it may be necessary to add a fifth solid-fuel stage.

The superspy's brain is a complex of solenoids and transistors. Its spatial voice—a ground-beamed transmitter; its eyes—heat-sensing infrared detectors, terrain-probing radar and high-speed aerial cameras. And deep within the diabolical sphere beats an electronic heart—a delicate timing device.

As Explorer III arcs toward enemy ter-



~~see~~ see Aug 68, 22

ritory—sprawling there a thousand miles below—the timer trips a solenoid. Automatically, a half dozen camera ports slide open, revealing long-focal length lenses. Solar-powered, an image orthicon—akin to a television's picture tube—comes suddenly alive. With a whine, a radar's transmitter is actuated, its rays straight-aimed at enemy soil and enemy secrets.

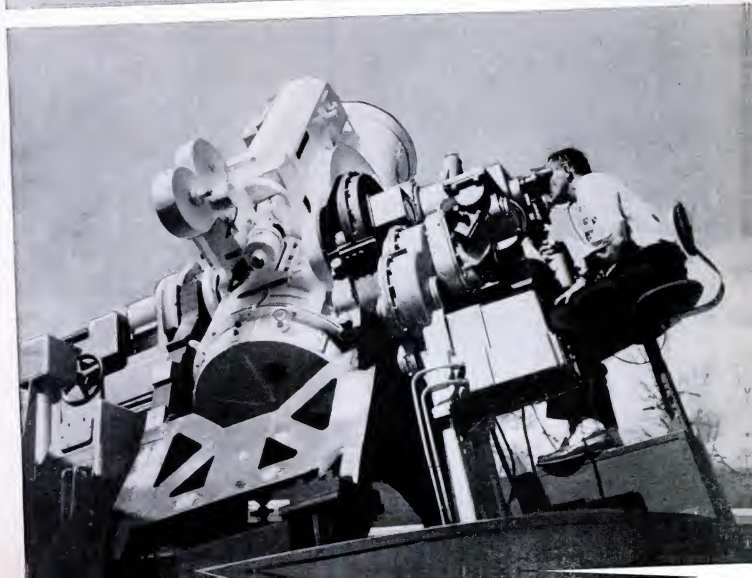
Radar reaches through miles of atmosphere and murk—to map an industrial city with better-than-atlas accuracy. Moments later, through a hole in the overcast, the orthicon tube's flat face unmasks an airfield and the fuzzy, yet discernible, out-

lines of its hundred atomic bombers. Farther on, the infrared detectors strip a steel mill bare of camouflage, as the telltale heat from its blast furnace burns indelibly into the detectors' film-strip memories.

Mission accomplished, the timer clicks again—closing the lens ports, dimming the orthicon, depowering the radar. Locked inside the demon spy, magnetic tape and film, are enemy secrets.

Forty-five minutes later—and on the other side of the earth—the satellite orbits over friendly territory. Once more its timer clicks, energizing powerful transmitters. Far below, complex recorders receive the

Air Force plane 10 miles away was photographed with 500-inch focal-length tracking camera, shown below





Photos above and below show accuracy of infrared reconnaissance. Bright spots in bottom photo, taken at night, pinpoint the areas of greatest activity. Photos courtesy Sercor Corporation of America



SHOULD BE AIRCRAFT CAMERA & INSTRUMENT CORP. (SEE JUNE 58 PAGE 8)

intelligence report not even one hour old.

Spy satellites are well past the design stage on both sides of the Iron Curtain, their missions already set—and likewise their launching dates.

Russia, by party boss Khrushchev's own admission, has been six years at work on a celestial spy (likely Sputnik VI or VII). Last October, at the International Astronautical Federation conclave in Barcelona, a top Soviet space scientist conceded that Russia's spy satellite will be capable of "keeping constant watch on the activities of the entire world."

Less vocal are spokesmen for Lockheed Aircraft's Missiles Systems Division on the Stanford University campus where, since early 1956, our scientists have been engaged in putting together "Pied Piper," official name for the United States' hush-hush spy satellite. The project is also nicknamed "Big Brother."

It's an open secret that at least \$12,000,000 have already gone into the project, officially coded Weapon System 117-L. Pied Piper's launching date, like that of its Russian counterpart, is already set for sometime next year.

The problems, basically, boil down to adapting proven techniques in aerial photography, telemetering (robot air-to-ground communications) and tracking—to space.

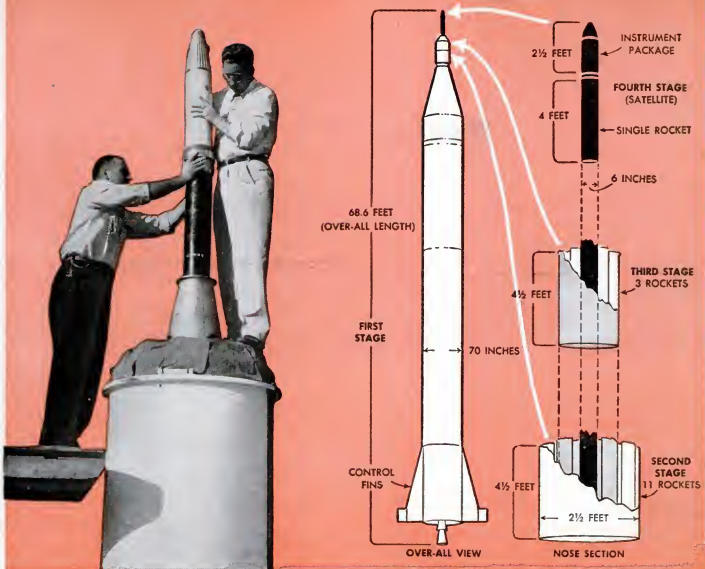
Typical is the problem of "resolution"—a television or film camera's ability to record detail from high altitudes. Will Explorer III be able to peer into your back yard? And, having turned spatial Peeping Tom, will its electronic eyes be capable of differentiating between objects as small, let's say, as your car? Or, of more concern to military men, between a tank, warship or bomber?

Today's best aerial cameras (including the still-secret system installed in the new B-58) reportedly can peek into your back yard from 50,000 feet and clearly detail everything over one foot square.

The same camera installed in a spy-satellite orbiting 100 times higher would do well to define the outline of a ground-tethered B-52. It might even have trouble pinpointing the runways. And as for your car? The camera wouldn't see it at all.

But the B-58's aerial eye, with its 36-inch focal length, is puny compared to cameras now under development, their focal lengths nearly three times as long, their magnification and resolution far higher. What's more, their lenses are "folded"—through a series of mirrors—into an all-seeing package no larger than the B-58 camera.

The real problem, however, is transmission. Ground-stationed intelligence ex-



perts won't have at hand the original negative. That'll remain in space. What they will have is a facsimile of the original.

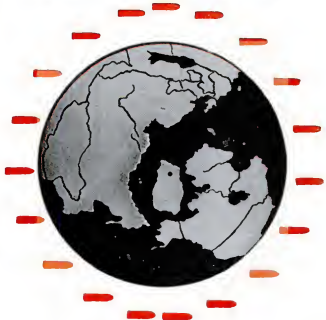
To understand the difference—and how it will dim Pied Piper's perception—let's study a hypothetical spy camera. The camera's "resolution" is rated at 40 lines per millimeter. This means that along every millimeter of negative, the lens implants 40 dabs or "bits" of image. Thus, one million "image bits" will be compacted into every square inch of negative. And the greater the number of "bits," the better a camera's ability to separate and define small objects.

A good example is a photo in your daily paper. Examine a newspaper photo under a magnifying glass and you'll observe that what seems to be a sharp picture (at a distance) is really composed of hundreds of little dots and dabs. The more dots, the sharper the picture.

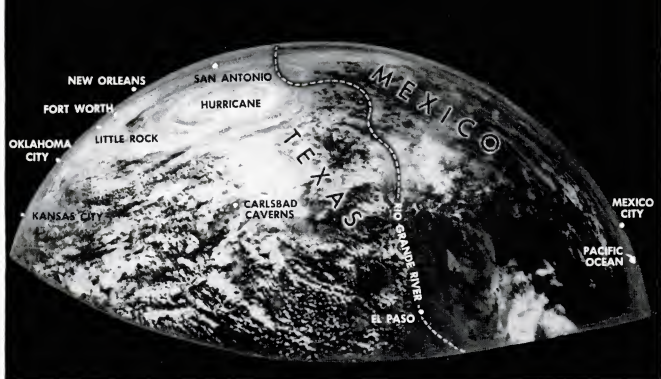
The same applies to aerial cameras and their films. And the camera we're talking about records one million bits of image to each square inch of film. Since a standard aerial negative is nine inches square, a little multiplication shows that 81 million bits of image can be implanted on this single negative.

America's first artificial satellite, Explorer 1, was carried into orbit as the needle-nose of the Army's Jupiter-C rocket, shown in photo and diagrams

Orbiting around the earth at a speed of approximately 18,000 miles per hour, the Explorer satellite always "points" in the same direction. It moves headfirst, sideways and tailfirst—like a pencil you move in a circle but always hold parallel to the floor







From 100 miles up, a camera in a Navy Aerobee rocket photographed over a million square miles of earth

### Transmission Problem Being Licked

But to relay this image to a ground station, it must be transmitted. Suppose the transmitter's frequency is 10 megacycles, or 10,000,000 cycles per second. Now, for every cycle only one bit of image can be transmitted. Thus, you're limited to 10,000,000 bits of image per second. What happens to those other 71,000,000 image bits still on the film? Well, unless you concoct some pretty tricky circuits, you lose them. They're still on the film, of course. But the film's in the satellite. And you're on the ground. In short, all-seeing as may be your spy-camera, it's limited in transmission.

Actually, the transmission problem is close to being licked. Still, the illustration explains not only the difficulties, but why ground-bound intelligence agents may have only a reasonable facsimile of what the spatial spy sees.

Pied Piper, though, will have other eyes.

Right now in development, for example, is Servo Corporation of America's infrared sensors, capable of "thermally" mapping enemy terrain.

Explains a Servo spokesman, "every object emits infrared radiation. And the hotter an object, the greater its infrared radiation."

### Detects One Degree Difference

So heat-sensitive is Servo's newest and still secret airborne infrared detector that it'll differentiate between objects one degree warmer (or cooler) than their surroundings. Infrared sensitizers can strip camouflage from major areas of military importance—especially cities, secluded industrial hubs, perhaps even airfields.

Infrared detectors thus far declassified can, from operational heights of 50,000

feet, spot roads (which absorb heat, thus stand out from bordering terrain), trucks and tanks (revealed by their hot engines), cities and factories (exposed because the air above them is warmer than surrounding air) and ships (whose props, mixing warm surface water with the colder below, inevitably trail a cooler-than-surface-water wake).

Recently released by the Air Force were infrared photos taken at night, which clearly show not only a road, but a tank and its tracks. Another nighttime exposure pinpoints an airfield's runways, moving planes and fueling trucks, all detected thermally.

### TV Tube Films Heat

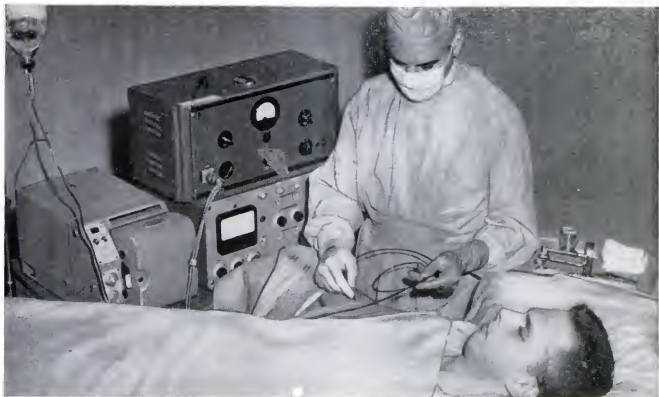
Says a military expert, "If infrared told us nothing more than when an enemy's strategic far-northern port was iced in, and shipping tied up, that might in a given situation be enough."

Servo's system is built around a camera lens or TV tube which translates a heat image into a light image—exposing infrared film. The film, automatically developed as the aerial spy hurtles through space, is "scanned" by special electronic devices, the light image translated into electrical impulses and these transmitted to ground receivers.

Ground receivers are not only in the works, but have successfully passed field tests. One of these, by Hycon Manufacturing Company of Pasadena, Calif., was originally designed for front-line combat surveillance from low-flying drone planes rigged with aerial cameras. A newer, TV version was recently tested by the U.S. Signal Corps' Combat Surveillance Department at its proving grounds.

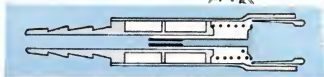
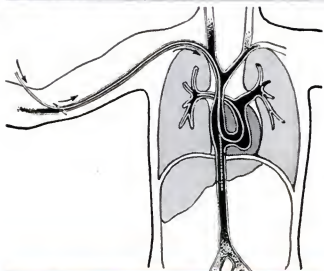
(Continued to page 248)





## Tiny Meter Moves in Veins To Record Blood Pressure

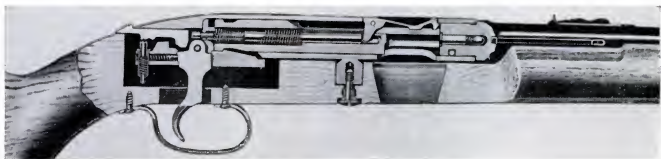
With a tiny meter about the size of the head of a match, doctors can measure blood pressure in the veins. Although doctors have long been able to measure the pressure of blood in the arteries, the blood pressure in the veins has been difficult to measure. In experiments by Dr. Herbert O. Sieker of the Veterans Administration, the little meter is fastened to the end of plastic wire and inserted in a vein. It then may be gently pushed into the chambers of the heart and blood vessels of the lungs. Slight variations in the blood pressure are sensed by the meter and transmitted as electrical impulses to an amplifier and a recorder. The meter itself was developed by Dr. Otto H. Gauer and E. Gienapp.



## Single-Shot .22-Caliber Rifle Has Features of Automatic

Dubbed an "automatic single shot," the new .22-caliber Winchester Model 55 rifle is loaded through the top of the chamber. Loading the rifle automatically puts it on

safety. Once it has been fired, it's unnecessary to cock again unless the trigger has been snapped on an empty case or without a round in the chamber.



An aerial photograph of a winding mountain highway. The road curves through a steep, rocky landscape. Several vehicles are visible on the road, including a large white semi-truck in the lower left, a white van, and several smaller cars. The road has a yellow center line and a white edge line. The title "How to Stay Alive on Mountain Highways" is overlaid in large, bold, orange-red letters on the left side of the image.

# ***How to Stay Alive on Mountain Highways***

Summer traffic in the high country passes over the yellow line to get ahead of a slow-moving trailer truck. More-potent drivers, meeting a jam like this, wisely escape tension by pulling out of line at the next parking area to snap photographs, have a picnic lunch or take a long look at the scenery



**By Gilbert R. Carrel**  
CHIEF, COLORADO STATE PATROL

**I**N THE WEST this summer, a record eight million vacationing motorists will travel high, weather-swept passes and deep, twisting canyons for the first time. A few will die for their mistakes. The tense majority will drive ineptly, to their own and others' discomfort.

This needn't happen. Despite steep grades, hairpin switchbacks and terrifying (to the uninitiated) drop-offs, major mountain highways aren't the treacherous shoot-the-chutes that flatland drivers picture. Normally, they're smooth, wide, safely engineered highroads to relaxation and sensational scenery. With caution, a well-maintained auto and rudimentary driving knowledge, practically no one need fear high-country driving.

Here are easy, common-sense tips to make your Western vacation the safe, pleasant idyl you envision:

**Preventive Maintenance:** Too often, a driver killed in the mountains is the vic-

tim of neglected equipment. He noses down a grade at 60. When he stabs the brake for a curve, nothing happens—a brake line has ruptured. Or a tie rod snaps, or a bald tire blows. The result is the same. He crashes through the guard rail and flips into a river or plunges down a steep slope.

The condition of brakes, steering and tires is a life-and-death matter in the mountains. So are lights—at night and in bad weather. Engine failure, if it won't kill, can leave you stranded for the night on a high, desolate pass. So before taking your mountain vacation, insure safety with a thorough checkup of your car.

When you hit the foothills, have your carburetor adjusted for high altitude; it saves gas and insures pep. Make sure you



have enough oil and water. Service stations may be few and widely spaced; at night, many will be closed. Inflate your tires (including the spare). Carry tire tools and a good jack. Put some heavy jackets, blankets and food in the rear seat. In winter, early spring and late fall, tire chains are a must.

**Speeding on icy pavement, this driver skidded and hit a truck. The crash killed one and injured four**







Crossing the center line, above, courts head-ons and sideswipes. The auto, below, sped around a curve, sideswiped an oncoming car, hurtled through the guard rail and plunged down a cliff. Fortunately the driver escaped without injuries



**The Uphill Grind:** When entering that first canyon, slow down. You may have been rolling at high speed on the plains, but you can't do it in the mountains. Mountain driving isn't more dangerous than the flatland variety, but it's different. Until you get the feel, be conservative. Ease into the turns, observe posted speeds and yellow, no-passing lines. Stay alert. Many canyon accidents happen in those first unfamiliar miles.

Passing uphill takes judgment. After an hour in a canyon, a steep upgrade may seem level. So be sure you have plenty of power and clear highway ahead before you swing out. Always use the gear that gives you the best speed-power ratio. Often you'll get stuck behind a slow-moving truck. Be patient. He's doing his best and



will let you pass at the first pull-out or passing strip.

If you feel nervous at the posted speed, take it easy. But watch your rear-view mirror. Most mountain states have no minimum speed laws but make it a violation to "impede the normal flow of traffic." When a half dozen cars line up behind you, pull out and let them by. It eases tension, forestalls traffic tickets, prevents "exasperation passing."

Above 8000 feet or so, overheating can be a hazard. But no stock auto should overheat if properly driven. At low speeds, shift down. Don't labor along at 20 miles per hour in third gear. This heats your engine and subjects it to unnecessary wear. Second gear may burn more fuel, but it gives you better circulation and cooling plus a comfortable feeling of power and control.

Keep an eye on the temperature gauge; remember, the boiling





When parking on a grade, it pays to block a wheel. The driver of the car in water failed to do this

point is lower at high altitude. If your car does boil over, don't scald yourself removing the radiator cap. If you can't restart, the trouble may be vapor lock, caused by overheating of your gas line or fuel pump. Pouring cold water on the pump may help; so may blowing in the gas tank. Otherwise, try opening the hood for better air circulation and wait a few minutes. Getting a push isn't advisable except on the straight and level.

**Driving the High Country:** Statistics show that most mountain collisions are caused by improper passing and following too close. Speed is the Number One killer. Not long ago, four GLs from Camp Hale, Colo., roared down a straightaway south of Leadville, Colo., doing 75. Rounding a curve four feet over the center line, they rammed a truck head-on. The impact pulverized their automobile and killed all four.

Drinking is another killer in the high country. Not only are sharp reflexes at a premium on mountain highways, but alcohol has harsher, quicker effects at high altitudes.

Rubbernecking causes its share of alpine accidents. Flatlanders find it a startling experience to see high mountains close at hand. But stop to enjoy the scenery. All mountain highways provide parking areas.

Make sure your emergency brake is set, your engine in gear, your wheels turned to prevent a roll. If necessary, block a wheel with a rock—a good idea, too, when changing a tire.

Climbing the passes, you'll meet switchbacks and breathtaking drop-offs—often with no guard rails. You'll experience at



least mild acrophobia—fear of high places. But relax. The peril is mostly psychological, and tension can cause mountain sickness. Don't overexert if unaccustomed to high altitude. If you have heart trouble or similar disability, seek your doctor's advice about mountain driving.

Watch for deer and other animals crossing mountain highways, especially at dusk. A 700-pound black bear can fold your front



In tunnels, turn on your dim lights, slow down and watch out for water, ice, sudden change in light

end like an accordion. Even porcupines have been known to cause accidents. Also, there is much open range in Western states, and sheep, cattle and horses are likely to wander onto highways.

But camera-toting tourists are probably a worse hazard. So approach turnouts and parking areas cautiously, expecting congestion. If you park, don't wander thoughtlessly onto the highway.

Above all, don't straddle the center line when driving in the high country. In "bad" places the tendency to shy away from the edge is almost irresistible. But with rock walls crowding the inside lane, you leave no room for the other guy. Straddling causes far more mountain accidents than it prevents. Typically, near Idaho Springs recently, four teen-agers rounded a curve in the wrong lane and were killed in a collision with a truck.

**About Weather:** On the plains, in summer, weather is normally a minor driving hazard. Not so in the mountains. On high, exposed highways like Trail Ridge Road in Rocky Mountain National Park, winter can come anytime. Snow squalls in July are by no means unheard of. Fog, sleet, freezing rain and wet snow can turn normally safe pavement into a slick, treacherous deathtrap for the unwary.

Clouds are the tip-off—not the fluffy white cumulus ones normal to summer afternoons, but the dark, boiling sentinels

of warm or cold fronts. Check with a ranger in advance, or catch a report on your car radio. Watch the passes and avoid storms.

If you do get caught "on top" in bad weather, stay calm. Keep moving, if it's safe. But go slow, and test your braking ability often. In rain, fog or snow, turn on your lights. Low beams will give you best visibility; at night in these conditions, high beams only reflect back in your face.

If visibility becomes too bad, stop and wait it out. Don't try to walk out you'll only get lost or hurt in a fall. If it's cold, wrap up in blankets or extra clothing. Run your engine for heat only if your exhaust system is perfect. Don't let wind blow fumes under the car. Don't let snow drift over your exhaust pipe. Carbon monoxide has killed hundreds of stalled motorists in the mountains. Beware of drowsiness; it may be a warning.

In the canyons, weather poses many hazards that flatland drivers rarely anticipate. For instance, during cloudbursts, rivers may boil up and wash out bridges and even highway sections. During freezing weather, in shady patches or on bridges, pavement otherwise clear for miles may be icy.

Anytime it rains, water washes mud from under rocks on the hillsides, thereby loosening them. Even where canyon walls aren't steep, a murderous barrage may be in prospect. Again, stay calm. Your chances

**WARNING**  
WATCH FOR  
**ROCKS**  
ON HIGHWAY

of getting hit are small. But you might crash into rocks lying on the highway, so guard against that.

Don't park. Keep moving at maximum speed and don't block traffic. Last summer, during a rainstorm in Clear Creek Canyon, Colo., a 200-pound rock slammed into an auto. The impact spun the car around, killing a youngster in the back seat. The accident was bad enough. But well-intentioned motorists who stopped to help stalled Sunday traffic five miles up and down the canyon.

**Rolling Downhill:** No single failing causes more mountain accidents than faulty downhill technique. The cause is obvious: The

combination of steep grades, gravity and hurtling two-ton autos.

Incredibly, many motorists still coast downhill. Others ride their brakes, causing the bands to heat up, expand and lose contact with the drums. Patrolmen stop hundreds of motorists each year with the dreary warning, "Your brakes are smoking; you're heading for a crash."

Prevent such a disaster by keeping your engine in gear, letting compression hold you back. You needn't fear reasonable speed on the downgrade. On steeper grades, shift down to the same gear you'd need coming up the hill.

**It's Your Responsibility:** Armed with these tips, any motorist can drive the high country with the assurance of a veteran. The prospect shouldn't unnerve you.

With the vast, monotonous distances in the West, drowsy motorists are one of our worst headaches. To remain alert, you just

stop and rest. Walk around, drink coffee, sleep. Fresh air alone doesn't help much.

Unfortunately, some tourists try to drive from Los Angeles to Denver (1500 miles), stopping only for food and gasoline. Recently, a motorist left Yakima, Wash., bound for Denver, intending to drive it in one 24-hour belt. He dozed once in Utah and hit the ditch. But he went on. Near Rangely, Colo., he fell asleep again. This time he slammed into a rock wall, caromed across the highway and rolled down the slope, killing himself and his daughter.

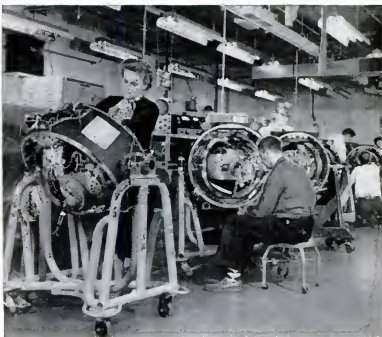
Such rashness may be hard to conceive. But Dr. Leon Brady, director of research for safety education at New York University, explains: "The problem of safe, lawful, courteous driving is primarily one of emotional make-up and social adequacy."

That goes double in the mountains. If your attitude is wrong, confine your driving to the golf course. ★ ★ ★

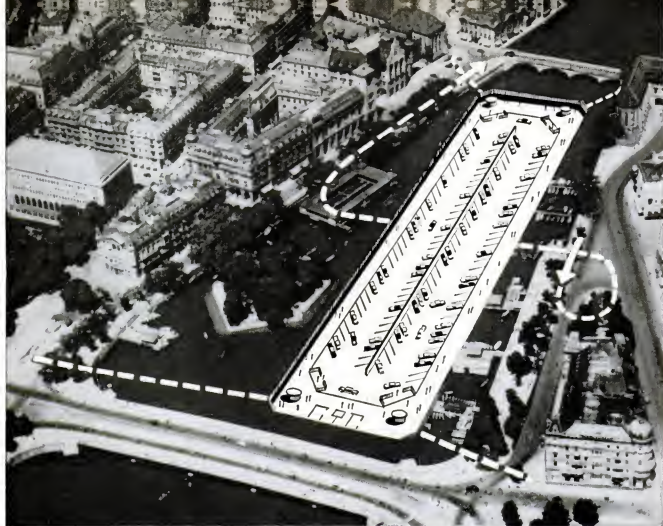


## Dustfree Workers Make Missile "Brains"

Automatic "brains" to guide ballistic missiles are now being manufactured under the sterile conditions of a surgical room. The inertial-guidance system for the Thor intermediate-range missile is in production by AC Spark Plug. The parts are made to tolerances as high as  $\frac{1}{25,000,000}$  inch. Even a speck of dust could alter the course of the missile, so production workers wear nylon hats, smocks and shoe covers at all times. The guidance system detects changes in the missile's course, computes corrections and feeds the answers to the missile with the speed of light.







Dotted lines at corners of underwater garage indicate pedestrian tunnels. Cars would enter, leave at middle

## Zurich Plans Parking Lot for 500 Cars Under Limmat River

SWITZERLAND'S LARGEST city, Zurich, hopes to solve part of its traffic problems by building a 500-car parking garage at the bottom of the Limmat River. The river bed will be dredged from its present depth of 13 feet to 39 feet. Four concrete

pontoons will be towed to the garage site. Then two parking levels will be built on the pontoon raft which will sink gradually into the dredged cavity. Pedestrian tunnels will run to the four corners of the underwater garage.

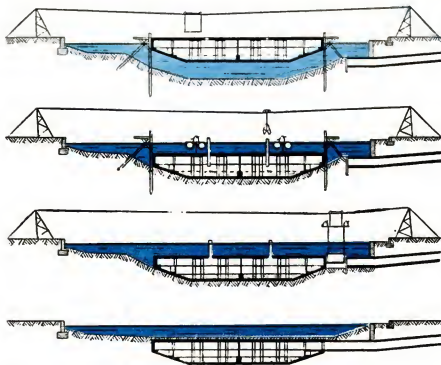


Diagram shows how two-level parking garage would be erected on series of pontoons anchored above dredged area of Limmat

To help sink concrete structure, loads of gravel ballast would be dumped on the roof. Workmen could enter through "chimneys"

Tunnels for cars and pedestrians, previously built to edge of garage, would be connected and internal construction would be finished

River bed finally would be leveled with gravel and sand to provide anchorage for boats. Shops are planned along outside walls





Photo by Nissen Trampoline Co., Cedar Rapids, Iowa  
**Trampoline diving is just a matter of jumping feet first into springy nylon. Unit can be located anywhere**

## Trampoline Diving Board Suits Big or Small Pools

HOMEOWNERS with big or small back-yard swimming pools can make a big splash this year with a portable trampoline diving board. Even an inexperienced diver can perform tricks on a trampoline. He simply climbs to a low platform and jumps feet first onto the trampoline bed. The nylon bed, attached to the frame by springs or cables, bounces the diver into the air and over the water with little exertion on his part.

**Trampolines put as much bounce in your dive as any of the wooden springboards**  
 Photo by E. P. Finigan Co., San Francisco, Calif.



**Here's a jackknife dive from a trampoline diving board. Springs help such tricks**





When the jet stream prowls south of its normal course across the country, tornadoes may strike by the dozens

## ***The Jet Stream Is the Villain***

*—They're blaming tornadoes, hurricanes, floods on the vagaries of these high-flying rivers of wind. But the hitchhiking airliners like them.*

**By Frank J. Taylor**

**T**HE PHONE JINGLED in the office of Don C. House, Supervising Forecaster of the SELS (Severe Local Storm) Forecast Center in Kansas City, Mo. On the long-distance line was a New York reporter who had an assignment to do an eye-witness story on tornadoes. "When can you guarantee me some tornadoes out there?" he asked.

"Wait a minute," said House, shuffling his weather maps. "I can't guarantee them, but if you'll be here tomorrow I think we'll have some for you."

Catching a plane, the newsman arrived in Kansas City just in time. A series of storms swirled up in the predicted area. The SELS forecasters even pinpointed one of them in advance so accurately that the reporter was on hand when the twister spiraled into the sky.

The astonished visitor wanted to know how House could tell in advance where and when the tornadoes would be born. For although the area within 500 miles of

Kansas City is the tornado incubator of the country—last year it gave birth to 900 of them—the average life of a tornado is only 10 minutes. Pinpointing them in advance calls for some meteorological wizardry.

House spread out a sequence of weather maps. Across each of them was a wide, black band, which had shifted south as each new chart was drawn, at 12-hour intervals. The dark, curving line across the country indicated the meanderings of the polar jet stream, a swift, high-altitude torrent of wind that whips eastward around the Northern Hemisphere between the 30th and 50th parallels.

This polar jet stream is the villain to blame for much of the country's disaster weather. In the six years since they established the SELS Forecast Center in Kansas City, Don House and his team of advanced weather experts have learned much about the affinity of the polar jet stream for severe storms—tornadoes, hail-

storms, cloudbursts. Whenever the polar jet veers south at the same time that moist, low-level tropical air masses are moving north from the Gulf of Mexico, the tornado spotters can expect trouble on the weather front.

A dramatic example occurred last spring. On May 19, the polar jet stream whipped in from the Pacific about halfway between San Francisco and Los Angeles, was tracked over Phoenix, Denver, Sioux City, after which it blew across the Great Lakes, New England and out into the Atlantic, causing no weather disturbance. But by May 20, at 9 a.m., it had detoured south and was checked over Albuquerque and Amarillo, after which it veered north. That afternoon, another shift brought it over Kansas City and St. Louis at an altitude of 30,000 feet, just as a mass of moist tropical air moved north up the Mississippi Valley. Recognizing the makings of catastrophic weather, the SELS Forecast Center alerted the threatened area over a network of radio stations.

During the late afternoon and evening, 50 tornadoes kicked up in Kansas and Oklahoma. In three days, there were 160 tornadoes in the area, accompanied by cloudbursts over the Kansas City environs. What happened, according to House, was that the atmosphere over the area was thrown off balance by the polar jet's shift. It took about five days of severe weather to restore equilibrium in the skies, just as it takes several days for the waters to recede after a river goes on a rampage during a flood.

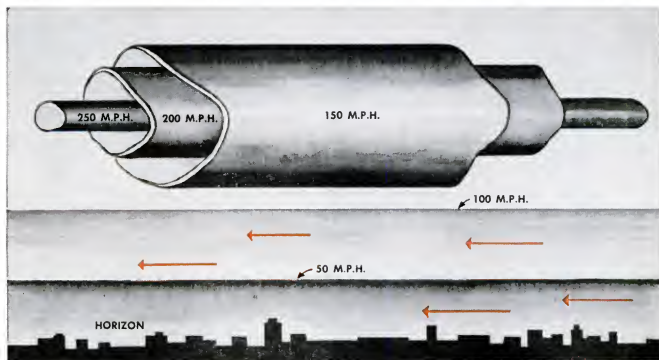
The polar jet stream was to blame for the Kansas weather binge mainly because

it triggered the cloudbursts that followed the tornadoes. Unlike low-level air mass movements, the big wind aloft carries little moisture. But often it does whip along cirrus banners of powdery ice particles which seed the clouds below. This kicks off a chain reaction of precipitation, such as the one that deluged Kansas, Missouri and Oklahoma in May, and one earlier that had drenched Texas last April, ending a five-year drought.

Airmen have known about the mighty wind upstairs since late in World War II, when B-29 bombers based in the Marianas encountered it over Japan. Often it blew so hard that bomber crews bucking it found themselves pinned motionless in the sky. To cope with it, they were obliged to overfly Japan at low levels, climb into the jet stream, make their bomb runs flying eastward, then ride the tailwind home. Pan American World Airways pilots have been riding the big wind eastward across the Pacific during the winter months for the past five years.

After the war the airlines, the Air Force and the Navy assigned teams of meteorologists to research the fantastic river of wind and find out how to put it to work. They soon concluded that planes could safely ride the jet stream nonstop from Tokyo to Honolulu, bypassing the refueling station on Wake Island entirely. At first, pilots were reluctant to try it, but in November 1952 Pan American's Capt. Logan D. Scott clipped seven hours off the Tokyo-Honolulu schedule and made the 3908-mile trip in 11 hours, 30 minutes. Since then Pan Am pilots have made hundreds of Tokyo-Honolulu nonstop flights during the winter

Diagram (not to scale) shows speeds of typical winds above surface, including the cylindrical jet stream





This man can blame jet stream for his loss. Weather Bureau now uses jet-stream studies to predict tornadoes

months, November to March, when the polar jet stream shifts southward to the Japan-Hawaii track across the Pacific. The record flight was made by Capt. John H. Kelly, who brought a Stratocruiser with a full load into Honolulu 9 hours, 18 minutes out of Tokyo. On that single flight, Pilot Kelly saved his company \$3000 in fuel and airplane time.

According to Kelly, "Inside the jet stream there's no weather at all. There are no clouds. You do not sense the extra

speed. It is smooth flying unless you drift too close to the north edge, where there is sharp turbulence."

Kelly and other pilots have discovered a trick for staying in the invisible, meandering jet stream. The center of the great wind river is 10 to 15 degrees warmer than its northern edge. By keeping an eye on the thermometer recording the temperature outside the plane (usually around 30 degrees below zero C.) they can hold a course in midstream. And garner the max-

Map shows result of the jet stream's dip to the south. It meets moist tropical air to touch off tornadoes





imum free ride, because the big wind's velocity is greatest at its center.

Though the jet stream was discovered and first put to work by airmen, it now looms even more important in the daily lives of the millions on the ground who are affected by the great wind's deviations from normal. Thus, tracking its willy-nilly meanderings from day to day and season to season has become a routine operation for a U.S. Weather Bureau-Air Force-Navy task force. Every day, for example, an Air Force weather-reconnaissance plane, jammed with instruments, takes off from Honolulu, flies north half way to Alaska, then returns via a dogleg that makes a 3700-mile overseas triangle. On two legs of the triangle, the flying weathermen usually pick up "the global wind band," as the Air Force calls it. If the Honolulu-based airmen don't find the big wind, another daily weather plane out of Fairbanks, Alaska, picks it up. A third triangle over the Pacific is flown out of Sacramento, Calif. The Navy operates weather planes out of Guam. The Air Force scouts the sky from Okinawa and Japan.

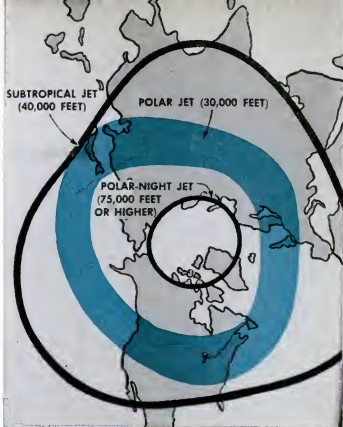
### Planes Drop Dropsondes

The weather planes release ingenious expendable mechanisms known as dropsondes, which are attached to small parachutes. As they float slowly down to the sea, tiny transmitters in the dropsondes report temperature, barometric pressure and humidity. On the weather planes, outside thermometers and wind indicators tell the airmen when they have cut across the jet stream. This and other weather information is relayed immediately to land stations which feed the facts into a vast international network.

"Each reconnaissance flight is like having 20 weather stations in the Pacific," explained Dean Parry, the Weather Bureau's jet-stream expert in Honolulu. "There's nothing more perishable than the weather, so in a matter of minutes the information is in the mainland forecast centers.

### Mistaken for Flying Saucers

On the continent the detecting is taken over by 100 U.S. Weather Bureau stations, each of which releases similar reporting mechanisms known as radiosondes, two to four times daily. The featherweight radiosondes are carried aloft by helium-inflated balloons—often mistaken for flying saucers as they glisten in the sky. As they rise, the radiosonde transmitters beam back a steady stream of reports on atmospheric pressure, humidity and temperature. In addition, the radiosondes, tracked by radio direction-finding equipment, reveal the



Map by H. Riehl, University of Chicago  
Here are normal courses of three jet streams over Northern Hemisphere. Polar jet causes most trouble

wind direction and velocity at all levels up to around 60,000 feet, where the balloons explode. Other radiosondes are sent up and tracked by ships at sea. Meteorologists in Japan, Canada and European countries are checking, too. Even Soviet Russia and Red China broadcast limited reports. Tracking the polar jet stream has become a global operation.

### Four Rivers of Wind?

The concept of a single invisible global river of wind has changed to a possible four in the Northern Hemisphere. Another stream has been identified in the Southern Hemisphere, and meteorologists think there may be more. Some meteorologists consider the name "jet stream"—which was coined by the late Dr. C. G. A. Rossby, meteorologist from the University of Chicago—an unfortunate choice, because "it's neither a jet, nor a stream, but a meandering global band of wind, often a hundred miles wide and two to five miles deep."

Over the Northern Hemisphere, the southernmost of these rivers of wind is the subtropical jet stream, usually 40,000 to 45,000 feet aloft, which whips over Texas and the Carolinas at such lofty altitude that it apparently has little effect on surface weather. The arctic jet, in the far north, cuts across northern Alaska and Canada, at lower altitude, around 25,000 feet. The most recently discovered "planetary wind band," dubbed the polar night jet, flows around the earth 80,000 feet above the Arctic Circle.

The stream which wanders across the

(Continued to page 238)



By Art Railton

**WHAT HAPPENED?** That's the question Detroit keeps asking itself. It just can't be—this sudden reversal of the American collective mind. It never happened before.

The public has suddenly become big-car conscious—conscious that its cars are too big, and getting bigger. It's not so much that the small car has won converts as that the big car has lost them.

**Everybody's picking on Detroit these days. Everybody from a Senate investigating committee to the Mayor of New York and a Bishop of the Methodist Church. The charge: Cars are too big, too pretentious, too wasteful.**

Perhaps the public finally discovered it has been oversold. A new car may not be worth what it costs to buy and operate. It's cheaper to spend some money putting the old car in good shape. At least, by this time you've got the "bugs" out of it!

Just a year ago, American Motors was virtually out on its feet. The financial pages were filled with sad stories about plans to liquidate the auto division.

Today, American Motors is making money on cars for the first time in years. Yet it's not doing a thing differently from what it did a year ago. It hasn't changed, the public has.

But this is no time for complacency. Once the Big Three bring out their small cars (as they must) the rat race will begin. American Motors may have the field to itself today, but its advantage is temporary.

### Chrysler Still Looking?

Success of the reincarnated 1955 Rambler astounds the industry (1000 Americans are being built and sold each week).

So panicky is Detroit becoming that usually reliable trade magazines print unfounded small-car rumors. One such rumor is that Chrysler will soon resurrect the 1955 Aero Willys (an excellent small car, by the way). Some time ago, Chrysler did consider producing this car in Australia, but that's been dropped and there is no

truth to the story of domestic production. Chrysler says it is still looking at the small-car picture. It had better stop looking and start working or the picture will be over, leaving nothing to watch but competitors' commercials.

**Air suspension is certainly laying an egg as of the moment. The manufacturers aren't building it very fast and the public isn't demanding it at all.**

The fact seems to be that the industry scared itself into the air-bag race. Everybody thought everybody else had it, so all rushed through their own versions, perfected or not. Sub-zero weather and air suspension don't go well together. Valve freeze-ups result. Anyway it takes an expert to tell the difference in ride.

Who will spend \$150 for something you can't feel and the neighbors can't see?

### Revived "T"?

Bill Ford broke the no-talk-about-the-small-car rule and mentioned that Ford has clay work done on the new "small Ford" which, he stated, would not look like the British Ford ("it has to be more streamlined than that"). He wouldn't say any more about the car but it is generally assumed to have a 102-inch wheelbase. This is the same wheelbase as the original Ford Thunderbird. It may be mere coincidence, but it could mean that Ford is saving time by using some engineering work from the old T-Bird. Close your eyes and visualize a thin-roofed four-door body on the basic Thunderbird shape and you've got yourself a right smart-looking buggy, Mister!

**Whatever it looks like, it will have no spaceship tendencies in its styling. Experience with Mercury convinced Ford that the public is not as ready to accept advanced design as some stylists think. There's still a lot of folks who like a car to look like a car.**

Vauxhall sales are better than expected, says Pontiac. Can't ship them over here fast enough. This month they begin importing the new Vauxhall Cresta. It is larger than the Victor and has a six-cylinder engine. It's real deluxe all the way.

If this Cresta catches fire over here at about \$2600, Detroit will have more adjusting to do. It would prove that the public will pay extra for a well-finished "small" car and that everybody who wants a smaller car is not a penny pincher.

Citroen hopes to sell 10,000 of its 2CV models in this country in 1958. The 2CV is the utterly ugly, virtually indestructible favorite of the French farmer. Price is about \$1200. It has a one-year guarantee—parts and labor free! If they sell 10,000 of these corrugated boxes here, stylists will jump out windows all over Detroit. ★ ★ ★



## Amphibious Helicopter Rides Outrigger Floats

With the addition of two floats, a Vertol HUP-2 helicopter has been made amphibious. This makes the craft safer for over-water operations such as carrier duty and antisubmarine warfare. The bottom of the fuselage was reinforced to withstand landing impact, and the lower nose window was replaced with aluminum plates. The floats are outboard of the center of the helicopter. Tests show the craft can taxi forward or backward, regardless of wind direction.



## California Race Track Uses Big Blower to Dry up Muddy Spots

Horses at Santa Anita race track will find more solid footing on wet days because of a huge machine called a "jet blaster." The powerful machine is driven onto the track

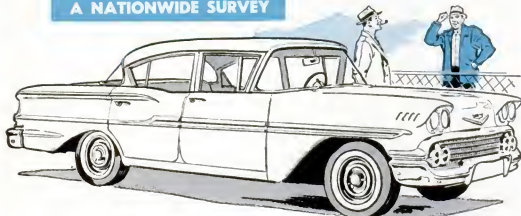
where it forces a blast of warm, dry air into soft spots left by the rain. The device to end muddy tracks got its first test during the recent winter season.



OWNERS  
REPORT

A NATIONWIDE SURVEY

## CHEVROLET Owners Rate



## Three Peas in a Pod?

It's amazing how similar are the opinions of owners of each of the three makes surveyed.

Such similarity shows that the companies have reached a common ground. Most differences seem to be in styling.

Blindfold test rides in the three makes prove how slight the differences really are.

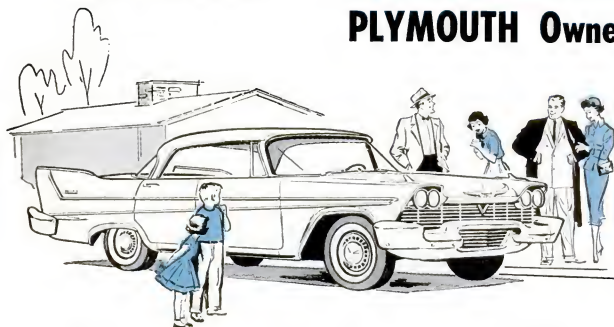
Not only are the best-liked features similar, but the complaints are also.

What about owner loyalty? Ford wins out here, although more Plymouth and Chevrolet owners plan to move up to bigger cars in the same family.

## FORD Owners Rate



## PLYMOUTH Owners Rate





## Handling First, Comfort Second

MARGINAL COMMENTS BY  
ART RAILTON, PM's  
AUTOMOTIVE EDITOR

CHEVROLET'S all new for 1958. Except for its engines, that is. And even there, you can get an all-new 348-cubic-inch V8 engine if you want to pay extra for it. (The standard V8 is the 283-cubic-inch design offered as an extra-cost option last year.)

Built longer and lower, the 1958 Chevrolet has as its backbone a rugged X-frame similar to the one used by Cadillac. Its styling is refreshingly different in the rear and reassuringly familiar in the front. Unlike Ford's crisp, incisive look and Plymouth's sleek, racy look, Chevrolet exemplifies the rounded, prosperous "loaf of bread" look that is characteristically General Motors.

What do the owners think of this all-new car? For the actual percentages of likes and dislikes turn to page 107. The following quotations describe the best-liked features in order of frequency of mention.

GM is betting that the public has had enough soaring tailfins.

## Handling First, Styling Second

MARGINAL COMMENTS BY  
ART RAILTON, PM's  
AUTOMOTIVE EDITOR

FORD may not be all new for 1958, but it's a lot newer than the usual facelift between shell changes. Completely different is its front grille-bumper arrangement and changed beyond recognition is the tail.

But the shell and the passenger dimensions remain unchanged from 1957. Its sheet metal retains the middle ground between the more traditional automobile styling of the Chevrolet and the radical airplane-type styling of the Plymouth.

What do the owners think about the Ford? For the actual percentages of likes and dislikes turn to page 107. The following quotations from owners taking part in PM's nationwide survey describe the best-liked features in order of frequency of mention.

"This is a car that you are boss of. You can drive it on a long trip and it won't wear you down."—Illinois pressman.

Long trips are more apt to tire you out than driving.

## Handling First, Comfort Second

MARGINAL COMMENTS BY  
ART RAILTON, PM's  
AUTOMOTIVE EDITOR

PLYMOUTH had a great sales year in 1957 and it recovered its traditional third-place in the industry from faltering Buick.

For 1958, it retained, almost without visible change, the styling that was so successful last year. These three cars are interesting because they present three stages of style changes: Chevrolet's all-new body; Ford's major facelift; Plymouth's minor identification changes.

Chrysler Corporation has traditionally had good luck selling second-year bodies. It will be interesting to see if the luck holds up through 1958.

What do the owners like and dislike about the 1958 Plymouth? Here are quotations to describe the best-liked features in order of frequency of mention. For a breakdown of the exact percentages for each see the table on page 107.

"Over-all driving is most effortless of any car I ever

Thus far it appears unlikely. It's a tough year for almost all cars.

## CHEVROLET

*Biggest improvement in Chevy is ride, especially on rough, undulating pavement.*

*It took the middle road: From the rear, Ford is horizontal, Plymouth is vertical, Chevrolet is diagonal.*

"I like its handling. Driving is so smooth and easy."—North Carolina bookkeeper.

"Handles beautifully on curves. Rides nearly as well as a Mark VII Jaguar on rough roads."—Illinois manufacturers representative.

"I like the easy ride on long trips. I ride to college 1300 miles per week and I need comfort."—Louisiana minister.

"More comfortable riding than in previous years although the rear seat of the station wagon rides hard."—New York rural mail carrier.

"An attractive car. Does not look like a rolling chrome factory."—Washington real-estate man.

"Clean lines. No fins to follow you."—Illinois accountant.

"They didn't go to extremes in styling. Didn't go out of this world and beyond, but just enough to keep Chevrolet owners satisfied."—Wisconsin draftsman.

"Has lots of acceleration."—Idaho contractor.

"Quick pickup. And it will make a U-turn on most any street."—Illinois laborer.

## FORD

*Disagree. Last year's Ford was a mighty handsome package. The facelift lost a little something.*

*It's refreshing to have a few owners praise economy.*

"Handles easy. I'm a rural mail carrier with an average of 300 stops per day. The car is easy to guide up to each mailbox."—Georgia mail carrier.

"Unusually good lines. Best styled car of the low-price three. Neat, streamlined front end."—North Carolina insurance salesman.

"Terrific styling. Long, even lines. Dual taillights."—New York janitor.

"Rides like sitting in a club chair."—New York owner.

"If you ever need the power to pass, it is there. You just press down and go. It has too much power, if anything."—Georgia clerk.

"I like the economy, especially the first cost. I traded a big car that was putting me in the poorhouse."—Illinois contractor.

"I like the miles per gallon. My V8 gets 14.6 miles per gallon in the city and 21 on long trips."—Texas soldier.

"Roadability. Good safe solid feel on the highway and on curves."—Illinois parts manager.

## PLYMOUTH

*Plymouth excels here. It takes corners like a sports car. Has a "just right" feeling about its balance.*

*He's the fellow Detroit is trying to please. It forgot the sensible guy who insists that comfort come first.*

owned. Excellent control at high speeds in gusty winds."—Oregon advertising man.

"It handles real easy. Ideal woman's car."—Ohio welder.

"Torsionaire ride is comfortable, driving is relaxed."—Delaware teacher.

"Low center of gravity gives outstanding ride. Smooth on straightaway, excellent around curves."—Illinois engineer.

"Lovely lines showing power, expressing personality without being too showy."—Rhode Island jeweler.

"I, like thousands of others, am willing to sacrifice some comfort for style. In my opinion, all cars were more comfortable in 1953 and 1954, but they were not as good looking."—Colorado cartographer.

"Plenty of pep from 30 miles per hour up."—New York insurance agent.

"More power than I can use. Gives a feeling of security when driving fast."—California foreign representative.

"Plenty of room in the car. Everybody can relax, not feel poured in."—Ohio salesman.

"Low operating cost with the six-cylinder engine. I use regular gas, average 19 miles per gallon on long trips."—New Jersey store owner.

"I got 23 miles per gallon on a long trip in this six-cylinder job."—Illinois archival assistant.

"Very spacious. Three ride very comfortably in the front or rear seat."—Florida civil servant.

"I am over six feet tall and it sits very good. I have plenty of legroom."—Oregon sales manager.

"Visibility is excellent, making it easy to park in back-in spaces."—Oklahoma soldier.

"Plenty of vision in all weather."—Florida contractor.

"Smooth transmission. Powerglide is the best for driving on ice and snow."—Wisconsin owner.

"Roadability is what I like most. But headlights and taillights plug with snow in a storm, especially the taillights, creating a rear-end hazard."—Wisconsin semi-truck driver.

"It's a good road car. It handles like the old Hudson. Very good on curves."—Idaho soldier.

*Here's how to beat the high-cost of motoring. But don't expect such economy around town with automatic transmission (even on the Six).*

*Except that the wipers don't wipe the sharp curve of faddish wrap-arounds.*

"Spacious view. Excellent for driver."—Illinois salesman.

"Automatic transmission is really smooth. You can hardly tell when it kicks over."—New York farmer.

"Inside color combinations and excellent material are what I like."—Wisconsin high-school teacher.

"Dual headlights help night driving and the four taillights make it safer."—Illinois truck driver.

*Ford's automatic is best of the three in judgment of this editor, all things considered.*

### And They Complain

But the Ford is not perfect. The owners have some things they don't like (although 35.7 percent did not list a single complaint on the questionnaire).

Here, in order of frequency of mention, are the complaints.

"Many body rattles."—North Carolina technician.

"I get 17 miles per gallon on trips with this Six. I expected better mileage."—Wisconsin forester.

"This 300-horsepower engine needs high-test gas."—New York insurance salesman.

"I am very disappointed in the economy of this Ford,

*Best of the three in this department.*

*What did he expect? He got power, didn't he?*

"This station wagon has all the room to be desired and more."—Illinois engraver.

"Roominess of trunk and interior."—New Jersey agent.

"Excellent visibility in all directions. Dual headlights improve night vision."—Kansas farmer.

"Large, wide, one-piece windshield."—Texas soldier.

"Very low upkeep. I just drove 3130 miles with three persons, a 14-foot boat, motor and trailer and luggage. It performed beautifully. Averaged 13.6 miles per gallon on the trip."—New Jersey superintendent.

"I have a six and get 22 miles per gallon on trips."—Florida salesman.

"I like the push-button shift which the children can't play with while I'm driving."—Virginia sailor.

"Corners like a sports car, yet the ride is soft as in previous years."—Maryland salesman.

*It's not all gain. Distortion and annoying reflections at night are some debits.*

*This editor doesn't feel push buttons are more convenient, but does agree they're out of the kids' way (and, unfortunately, out of the driver's way, too).*

### And There Are Complaints

Not everybody is completely happy with the 1958 Plym-

## CHEVROLET

### Next, the Complaints

*Test car had squeaks in steering column. Hood and steering wheel shook noticeably on rough roads.*

Chevrolet owners have some gripes, too. Here, in order of frequency of mention are the items most complained about by owners of the 1958 Chevrolet. (Of course, 35.4% of the owners make no complaints at all.)

"There are a lot of rattles in the dash and doors. No way to tighten the gear-selector lever or the collar around the steering post."—Wisconsin seaman.

"I bought one of the first Chevrolets sold. It appears to me that it was rushed through the factory. Minor body defects were overlooked. Right front door had to be refitted. Hood fits poorly. Dealer has tried to correct most defects, but sloppy assembly hard to overcome. I blame the factory, not the dealer."—Illinois owner.

"Minor troubles due to faulty assembly cause great inconvenience and humiliation."—Wisconsin insurance man.

"Car too low to get in and out. It is next to impossible for a big man to get in and out of the back seat of this Impala."—Georgia salesman.

*(Text continued on page 244)*

*Big men shouldn't try to get into the back seat of an Impala.*

## FORD

*It's good to see someone take the heat off the dealer. He's expected to correct every mistake — and usually can't.*

*Owners have been saying this for years and going right out to buy the newest, lowest models.*

since that was a factor in my changing cars. Unless the mileage improves, I will pay more for another car next time to get better than 10 miles per gallon."—Illinois teacher.

"This car, like all my postwar cars, had a series of minor faults that could almost drive a guy out of his mind. It puts a terrific load on the dealer's servicing facilities and accounts for the service that is sometimes called 'bad.' Manufacturers would have more efficient dealers and happier customers if they would do a thorough job of inspection before sending the car to the dealer."—Illinois salesman.

"Poor dealer service. In six weeks they cannot seem to find the time to repair leaky oil pan, leak in vacuum line, leak in transmission case."—Wisconsin sales representative.

"Engine runs too loud."—Illinois owner.

"All new cars are too low. Not convenient to get in and out. On unpaved roads there are ruts the car drags on."—Georgia school superintendent.

"Front seats are not comfortable. Steering wheel is too

*(Text continued on page 252)*

## PLYMOUTH

*Common complaint on all makes today. There is no excuse for it except poor quality control at the factory.*

*Apparently it never, never rains at a proving ground.*

outh although 27.7 percent register no complaints at all.

Here are the not-so-good things that the owners complain about, listed in order of frequency of mention.

"Despite factory inspection stickers, many small things were wrong. Rear deck partially unpainted. Seat bracket missing. Folding seat in wagon did not fold."—Maryland Federal employee.

"I was amazed to find so many bolts and metal screws that were not fastened securely. Some fell out as I was driving along. You begin to wonder if the motor will fall out."—Maryland supervisor.

"It has too many rattles, especially the doors. Seem to have a spring in them that vibrates and nothing can cure it. More rattles than in my 1951 model certainly."—Illinois telephone man.

"Water leaks around doors and the ventilator."—Maryland owner.

"When it's raining and you open a door, all the water pours in."—Maryland clerk.

*(Text continued on page 254)*



## SUMMARY OF CHEVROLET OWNERS' OPINIONS:

OVER-ALL RATING: Excellent 67.6% Average 27.0% Poor 5.4%

### Best-liked features

Handling ease	40.2%
Riding comfort	37.7%
Exterior styling	32.6%
Power, performance	31.0%
Economy of operation	13.0%
Roominess	8.7%
Visibility	7.6%
Auto. transmission	7.6%
Roadability	5.4%

### Most-frequent complaints

None at all	35.4%
Body squeaks, rattles	16.8%
Poor workmanship	11.4%
Hard to get in, out	11.4%
Poor gas economy	10.9%
Water leaks	7.1%
Poor ride	6.0%
Poor paint, chrome	4.9%
Steering trouble	3.3%

### Had trouble with engine?

No trouble	84.2%
Some trouble	12.0%
Considerable trouble	3.8%

### What was engine trouble?

Carburetor	5.4%
Valves, tappets	2.2%
Oil leaks	2.2%

### How is dealer service?

Excellent	55.1%
Average	38.4%
Poor	6.5%

### Would buy from him again?

Yes, would	70.3%
Undecided	21.6%
No, would not	8.1%

### Have air suspension?

Yes, do have	17.8%
No, do not have	77.9%
No answer	4.3%

### Is the air suspension you have worth the added cost?

Yes, it's worth it	33.3%
No, it isn't	18.2%
No answer, don't know	48.5%

### What make car was traded?

Chevrolet	66.0%
Another GM car	7.6%
Ford product	12.4%
Chrysler product	4.3%
All others	0.5%
No trade, no answer	9.2%

### What make will buy next time?

Chevrolet	63.8%
Another GM product	7.0%
Ford product	1.6%
Chrysler product	1.6%
All others	1.1%
Undecided, no answer	24.9%

## SUMMARY OF FORD OWNERS' OPINIONS:

OVER-ALL RATING: Excellent 68.9% Average 26.4% Poor 4.7%

### Best-liked features

Handling ease	50.2%
Exterior styling	37.3%
Riding comfort	31.1%
Power, performance	30.1%
Economy of operation	8.8%
Roadability	8.3%
Visibility	6.2%
Auto. transmission	5.2%
Interior styling	5.2%

### Most-frequent complaints

None at all	35.7%
Body squeaks, rattles	15.0%
Poor gas economy	12.4%
Poor workmanship	8.8%
Poor dealer service	6.2%
Noisy engine	5.2%
Not roomy enough	4.1%
Uncomfortable seats	3.6%
Car is too low	3.6%

### Had trouble with engine?

No trouble	79.3%
Some trouble	17.6%
Considerable trouble	3.1%

### What was engine trouble?

Valves, tappets	4.7%
Carburetor	4.1%
Timing	2.1%

### How is dealer service?

Excellent	54.4%
Average	33.7%
Poor	11.9%

### Would buy from him again?

Yes, would	67.9%
Undecided	23.3%
No, would not	8.8%

### What safety features in car?

Padded visor	54.9%
Padded dash	53.9%
Seat belts	6.2%

### What make car was traded?

Ford	65.8%
Another Ford product	1.6%
General Motors make	15.5%
Chrysler Corp. make	5.7%
All others	1.6%
No trade, no answer	9.8%

### What make will buy next time?

Ford	72.5%
Another Ford product	0.5%
General Motors make	7.3%
Chrysler Corp. make	2.1%
All others	1.0%
Undecided, no answer	16.6%

## SUMMARY OF PLYMOUTH OWNERS' OPINIONS:

OVER-ALL RATING: Excellent 73.6% Average 22.3% Poor 4.1%

### Best-liked features

Handling ease	50.8%
Riding comfort	39.7%
Exterior styling	31.8%
Power, performance	14.9%
Roominess	14.4%
Visibility	11.2%
Economy of operation	10.3%
Auto. transmission	8.7%
Roadability	7.9%

### Most-frequent complaints

None at all	27.7%
Poor workmanship	14.4%
Body squeaks, rattles	11.6%
Water leaks	10.7%
Poor gas economy	6.6%
Poor ride, low seats	5.8%
Poor dealer service	5.0%
Rear-view mirror	4.5%
Lack of rear legroom	4.5%

### Had trouble with engine?

No trouble	84.3%
Some trouble	14.0%
Considerable trouble	1.7%

### What was engine trouble?

Carburetor	3.3%
Oil leaks	2.1%
Water pump	1.6%

### How is dealer service?

Excellent	54.3%
Average	35.5%
Poor	10.3%

### Would buy from him again?

Yes, would	64.5%
Undecided	24.3%
No, would not	11.2%

### Exterior feature liked most

Low, long look	19.0%
Tailfins	11.6%

### Exterior feature liked least

Tailfins	14.0%
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### Fragile front grille

Interior feature liked most	14.9%
Dash arrangement	14.9%
Upholstery	14.0%

### Interior feature liked least

Seat design, lowness	7.8%
Rear-view mirror	6.2%

### What make car was traded?

Plymouth	36.4%
Another Chrysler make	12.0%
Ford product	15.3%
GM product	15.3%
All others	7.0%
No trade, no answer	14.0%

### What make will buy next time?

Plymouth	57.8%
Another Chrysler make	11.2%
GM product	3.7%
Ford product	2.5%
All others	2.5%
Undecided, no answer	22.3%

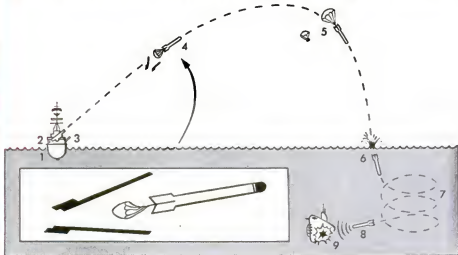


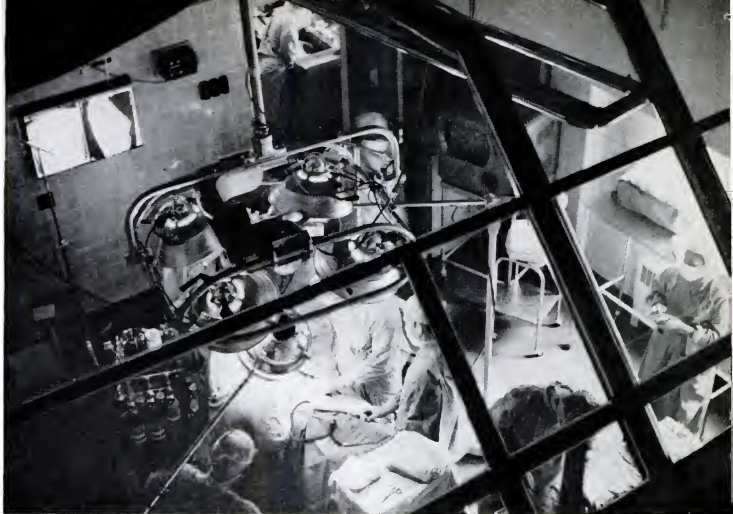
Navy's new RAT (rocket-assisted-torpedo) is launched skyward in pursuit of enemy submarine. Parachute lowers torpedo to the surface of ocean

## Navy Homing Torpedoes Fight Subs

AVAILABLE TO THE U. S. FLEET THIS YEAR and described by the navy as the "greatest advancement in antisubmarine warfare since World War II," the rocket-assisted-torpedo. The weapon, called RAT for short, is 16 feet long and weighs 450 pounds. It's launched skyward but parachutes open to stabilize its flight and slow the torpedo before it hits the water. The RAT was developed by the Naval Ordnance Test Station at China Lake, Calif., which also developed the Sidewinder air-to-air missile. Since the first announcement of the RAT (*Popular Mechanics*, Feb. 1958), the Navy has revealed that RAT missile systems can be added to most U. S. destroyers without major alterations. The launching device, complete with automatic-loading magazine, can be built onto existing five-inch gun mounts. Present search and fire-control equipment can be converted for rocket-assisted-torpedo use.

Diagram: Ship (1) detects sub, fire control (2) prepares to launch RAT (3). Airframe drops and first chute opens (4). Second chute opens (5) before torpedo hits water (6). Torpedo searches (7), then "homes" (8) and hits sub (9)





If commercial power fails during this operation, emergency generator will go into action automatically

# QUICK POWER WHEN **DISASTER** STRIKES

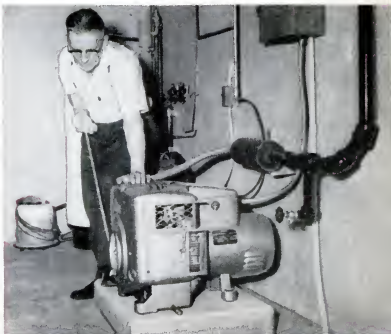
**F**LYING LOW through a canyon near San Francisco last year, a Navy attack bomber cut with guillotine efficiency two 220,000-volt power lines. Immediately, as power sagged or failed throughout San Francisco and as far south as San Jose, Calif., 1,100,000 persons got a jolt of confusion. This confusion was compounded by the minute as the dim-out lasted in some areas for more than an hour.

Radio stations broadcast slow squawks that sounded as if they came from an aged Donald Duck; TV stations went off the air; elevators stopped between floors; dentists' drills slowed; the motors of electric appliances in thousands of homes started smoking, and traffic signals blinked off, causing vehicle jams until police could be rushed to busy intersections.

"We live by electric power today," commented one writer, "and San Francisco was

*By Rafe Gibbs 225 Cherry St.  
Moscow, Idaho*

This stand-by gasoline-powered electric unit in a nursing home can be started like an onboard motor





Caterpillar Tractor Co. photo

Mobile electric unit provides emergency power so contents of footwear factory can be salvaged after flood

Besides providing power for industrial equipment, some mobile units carry big floodlighting systems

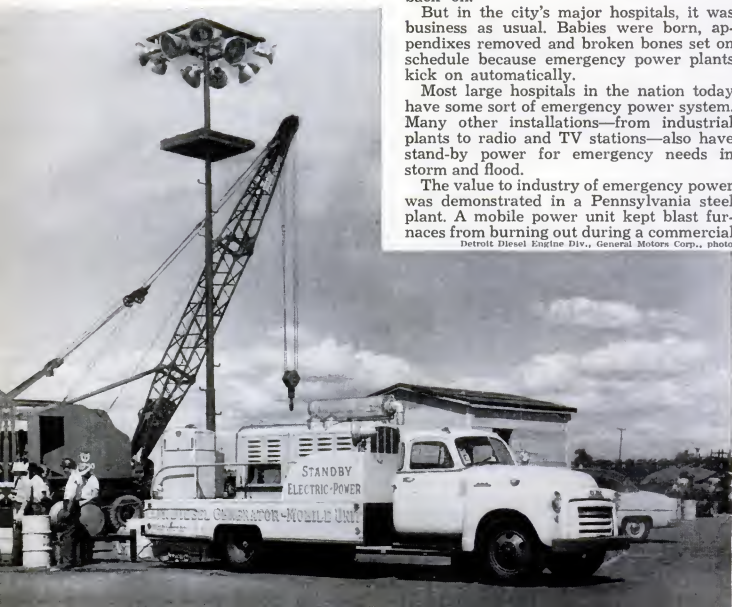
dying on the vine until the power came back on."

But in the city's major hospitals, it was business as usual. Babies were born, appendixes removed and broken bones set on schedule because emergency power plants kick on automatically.

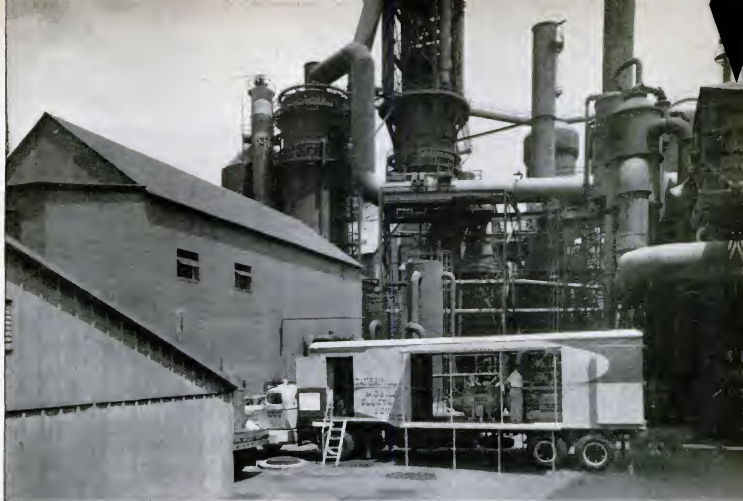
Most large hospitals in the nation today have some sort of emergency power system. Many other installations—from industrial plants to radio and TV stations—also have stand-by power for emergency needs in storm and flood.

The value to industry of emergency power was demonstrated in a Pennsylvania steel plant. A mobile power unit kept blast furnaces from burning out during a commercial

Detroit Diesel Engine Div., General Motors Corp., photo







**Auxiliary power at this plant operates water-cooling pumps to prevent the blast furnaces from burning out**

power shutoff—and from doing a possible million dollars' worth of damage.

Emergency power units have been constructed on truck trailers and on railroad cars for shifting to disaster scenes. Some of these mobile plants can develop up to 10,000 kilowatts of electrical power.

"But the point is," commented a Civil Defense official, "we just wish there were more emergency power on tap."

On a wintry day in Albany, N. Y., Robert Burdick and Marion Breen were sipping coffee in a cafe. They were en route to Vermont with a mobile diesel-power unit. That is, they were until the telephone rang.

Disaster had struck in the city of Rimouski, Province of Quebec, Can. An explosion in the city's utility plant had reduced power to nearly one half its normal capacity. Without any heat or light was 300-bed St. Joseph Hospital.

Burdick and Breen checked maps. "Seven hundred miles away," said Burdick. "Power may be restored by the time we get there, but we have orders to roll."

And roll they did, without stopping except for gas and oil. When they arrived in Rimouski they were needed—immediately.

Not only did they bring heat and light

(Continued to page 232)

**Massive 1000-kilowatt mobile generator of the West Texas Utilities Company can relieve a central station**  
Electro-Motive Div., General Motors Corp., photo





## Swedish Air Force Has Rocket-Powered Missiles

Sweden, historically a neutral nation, still keeps its arsenal ready. Its newest weapon is a rocket-powered anti-aircraft

missile that is fired from jet airplanes. Other new Swedish rockets are launched from land or sea to destroy surface targets.



## All-Transistor Portable TV

Every tube except the picture tube has been replaced by transistors in a television set described as the first truly portable "portable." In addition to the 31 transistors, the set contains two six-volt nickel-cadmium batteries which can be recharged 2000 times. The set can be operated during the charging cycle and will play six hours without recharging. The batteries can be recharged from a regular alternating-current outlet or any 12-volt direct-current source. Because low-cost transistors necessary for the portable TV are not yet available, the set is not expected to be seen in retail stores before 1960.



## Army's Giant "Power Drill" Uses Nine-Foot-Wide Bits

Holes up to nine feet in diameter can be drilled in the earth with a huge experimental auger developed by Army engineers at Fort Belvoir, Va. The big drill is used in the construction of gun emplacements, fortifications, wells and disposal pits. It's powered by a 192-horsepower gasoline engine and will cut a hole 25 feet deep at the rate of a half-foot a minute. Drills of various sizes are interchangeable.

## Stretchable Paper Prevents Tearing Of Bags When Under Strain

Grocery bags, cement sacks and heavy-duty wrappings can now be made of paper that stretches instead of tears when under strain. A bag made of the high-strength paper, called Clupak, has been filled with groceries and dropped more than 20 times without breaking.



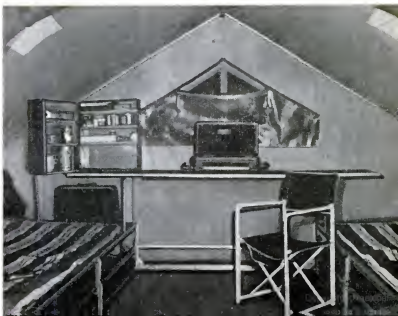
## Car Tent

CAMPERS SIMPLY DRIVE out from under a new tent, then erect it ready for occupancy in 10 minutes. The complete tent, including two double beds, is carried in a box atop the car. Stiltlike legs support the box during loading and unloading. When the tent is to be erected, the box is lowered to the ground. The frame then is swung into place and the canvas of the eight by thirteen-foot tent follows. The two beds swing up from the bottom of the box into the tent sides.

From bottom of the box, bed is swung up and into side of tent. Plastic covers protect premade beds



Tent can be erected in 10 minutes, has strong laminated-plastic floor. Below, long work shelf along back wall helps in kitchen duties, other camp chores







## Carving a Bowl From Plywood

By Bonnie Peplow

**C**OMBINING THE ANCIENT art of his ancestors with modern materials and tools, Hawaiian-born Ben Goo of Arizona creates decorative bowls of various shapes and designs from nothing more than pieces of scrap plywood.

He bonds the pieces together, then carves the block with wood chisels. A beautiful blending of the practical with the true art form, the bowls are used to hold dry foods, as centerpieces and other ornaments.

Goo's idea won't stop with this, however.

He plans to expand the project and carve sculptural forms using the discarded plywood. The art will be modern, he says. One type will be representational, sculpture intended to look like objects. For example, Goo reports the plywood would lend itself to sculptural forms of clamshells. The material already suggests the layers seen in clamshells. Another form is nonobjective, sculpture not associated with anything in particular, where the possibilities are unlimited, Goo says.

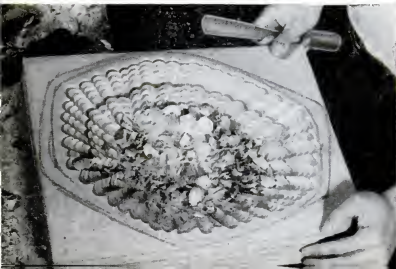


Ben Goo's first step in making plywood bowl is clamping pieces of scrap together as the glue hardens



After drawing the dimensions of the bowl's exterior, he begins carving the inside with a wood chisel

Now the bowl is in the roughing-out stage. Goo says the plywood is easy to carve with sharp chisels



He then smooths the interior with a flat chisel. Goo is an art instructor at Arizona State College



He points out that contrary to popular opinion, plywood is easy to carve with sharp chisels. Once he has carved a bowl to the desired size and shape, the first part of the finishing process is to sand it smooth. Then he raises the grain by soaking the piece in water to avoid this effect if it should come into contact with moisture later. Sanding it smooth again, Goo then saturates it with a mixture of tung oil and lemon oil. The tung is used for its penetration qualities, the lemon both for penetration and its aroma.

When the oil has dried several days, Goo covers the bowl with a wax made of 50 percent Brazilian carnauba. Pure carnauba is so hard, Goo says, that it is difficult to cut with a knife. Thus the wax provides a hard finish on the bowl.

As an art instructor at Arizona State College at Tempe, Goo has the opportunity to develop his philosophy of art. "An artist," he says, "should be able to express himself in terms of any given material. The creative use of materials which an artist meets finally leads to the art form."

"In other words," he continues, "thorough integration between the material and the

art form is necessary. The artist should learn to express the art forms without destroying the natural beauty and inherent character of the material."

This philosophy has been worked out through the years. Goo started work part-time at the age of 10 in his father's wood-working plant in Honolulu. There he had the opportunity to work with some of the finest craftsmen in the world.

He earned his bachelor of fine arts degree at the University of Iowa, majoring in sculpture and minoring in industrial design. His master of fine arts degree was earned at Cranbrook Academy of Arts, Bloomfield Hills, Mich., where he majored in sculpture and minored in ceramics.

On a nine-month Fulbright grant in Milan, Italy, he studied under world-famous masters including Marino Marini, noted Italian sculptor, who schooled Goo in the fine art of bronze casting.

Also in Italy, Goo worked with the architectural firm of Studio Architetti BBPR, under Ernesto Rogers, Enrico Perisutti and Count Lodovico Belgioso.

The teaching post at Arizona State College followed Goo's stay in Italy. ★ ★ ★



Next he sands it smooth. Later, he raises the grain by soaking the bowl in water and sands it again

Then he roughs out the underside. Bowls are used as centerpieces and for other ornamental purposes



Bowl begins to take shape as he saws unwanted exterior. Goo also plans to use this process in sculpturing

Last stage is smoothing and sanding. Finishing is with oil mixture, covered by a coat of hard wax



# THEY BUILT A DAM LIKE A ROAD

By K. E. Althoff

HIGH IN THE Colorado Rockies a unique dam has just been completed — but not without troubles!

This was a new challenge to the dam-construction business. Montgomery Dam was to be faced with asphalt and built with regular road-surfacing equipment. Plans called for the dam to be 113 feet high and 1900 feet long. It was to have an upstream slope of more than 30 degrees.

In the surfacing process, more than 19,000 tons of asphalt were spread on the face of the dam with a regular asphalt spreader, and faced with a road-surfacing roller. Hot asphalt, at a temperature of 303 to 332 degrees, was hauled to the top of the dam from a hot-mix plant at the base. During the quarter-mile haul the asphalt cooled about 10 degrees.

Because the top of the dam was only 20 feet wide, trucks were unable to turn around. To solve this problem the construction company built a 20-foot turntable. Trucks drove along the top of the dam to the turntable, were given a quarter turn and let down the face of the dam to deliver asphalt to the laying machine. Winches and steel cables raised and lowered the trucks and spreader.

Safety was a major consideration. In the event of mechanical failure of the cable, a driver would not have time to jump clear of the truck. For that reason all left-hand truck doors were removed. Only one failure occurred, and the driver escaped injury by immediately jumping clear.

Extensive experiments had to be made to determine the proper asphalt mix to withstand the climatic changes at the 10,000-foot elevation of the dam.

Held by a steel cable, a three-ton truck empties its load of hot asphalt mix into the lay-down machine 100 feet up from base of dam. Truck will be hauled up steep slope by winch, turned on turntable at top



Loaded asphalt truck hangs precariously on the steep slope as it is lowered by cable to the lay-down machine. Spreader lays down a strip 12 feet wide as it moves up dam. Four layers of asphalt were applied



Dam's steep slope and narrow top created problems. There was not enough room for machinery to turn around. Below, the lay-down machine is pulled on turntable and moved along dam to lay next strip





## French Town Builds City Hall With Ice-Cream Cone Design

Caen, France, battered during the Normandy landings 14 years ago, is rebuilding with a "new look" in architecture. One of

the structures, resembling an ice-cream cone, will contain city municipal offices, water tower, market place and dispensary.

## French-Built Coupe Has Chrysler V8 Engine

Auto fanciers with bulging wallets will like the elegant Facel Vega, a sports coupe powered by a 360-horsepower Chrysler V8 engine. The price of the custom-built beauty is \$9750, delivered in New York City. Built in France, the car has a frame of welded steel tubing, coil springs in front and leaf springs in the rear. There are four separate leather seats. Although it is luxuriously roomy, the coupe is only 15 feet long.



## Do-It-Yourself Airplane Carries Six Passengers

Intended for short-field operations, a plane designed and built by Alvin Ray Johns, with the help of friends, has a top speed of 140 miles per hour and climbs at a rate of 1000 feet per minute. Called the Ra-son "Warrior" X-3, it can carry up to six passengers or 1000 pounds of cargo. It's powered by a 185-horsepower Lycoming engine, has a fabric-covered steel-tube fuselage, fabric-covered wood wings.



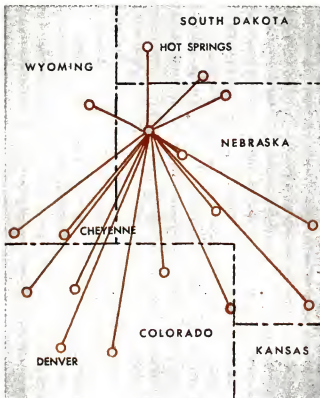




Dr. Howard H. Nininger and his wife, who literally follow flaming meteorites to the ends of the earth

## On the Trail of Meteorites

Map of one of Dr. Nininger's meteorite searches. Each of the small circles represents an interview with persons who observed a flaming object in the sky on a certain night. By plotting the reported paths of the meteorite on a map of the region, the search was narrowed to an area in western Nebraska



By George Worts

**M**ETEORITES GO FLAMING across the night sky. Somewhere they fall to earth. Hunting them down might seem as hopeless a task as trying to find the pot of gold at the end of a rainbow. Often it is. A Southwestern meteorist has spent the best years of his life tracking down these heavenly fireballs—and sometimes finding them. His tireless detective methods would win him the respect of Scotland Yard.

Since 1923, Dr. Howard H. Nininger, director of the Meteorite Museum at Sedona, Ariz., and an authority on meteorites, has closed in on 841 of these fragments from outer space. Because of his knowledge of meteorites and their habits, Dr. Nininger is now in consultation with the scientists who are working out the problems of missiles and manmade satellites.

### Metals for Missiles?

The missile men hope that a study of what happens to meteorites will be useful in deciding what metals will be most suitable for missiles. Most meteorites are composed of stone. Some are made of iron, nickel and cobalt. One million meteorites an hour—24 million a day—are plunging into our atmospheric envelope. Only one





Closing in on elusive particles from outer space. Dr. Nininger uses a mine detector to find meteorites

or two per day, weighing from two to four pounds, survive the passage toward earth. The others burn away their entire substance or turn to dust, creating dust trails 30 to 40 miles long.

Not only is the surface burned and worn off but the material itself changes. The missile scientists are experimenting with a variety of alloys to determine what combination of metals will stand up best in this enormous heat.

#### Atmosphere Brakes Meteor's Speed

The ordinary small meteorite, Dr. Nininger says, after hitting the earth's atmosphere at 26.5 miles per second, is quickly slowed down to the speed it would have if dropped from an airplane. Big meteors similar to the one that created a crater near Winslow, Ariz., thousands of years ago—Smithsonian Institution scientists recently declared that it was as large as a large house—are not slowed down so much and hit the earth at perhaps 10 miles per second.

#### Meteorites Land Cold

When a meteorite approaches our atmosphere its temperature is close to that of outer space itself—459 degrees below zero Fahrenheit. During the final few seconds of its fall, it becomes invisible, its surface coated with black slag. If the fragment is large enough, its surface heating may not have neutralized all its interior stored-up outer-space cold. Meteorites have been

found, shortly after their fall, covered with frost. Some have landed in hay and straw and others have pierced houses and barns, but there is no record of one ever having started a fire. Dried grass driven into the

(Continued to page 240)

Jewelry that's really "out of this world." Bracelet and necklace are cut from cobalt-steel meteorites

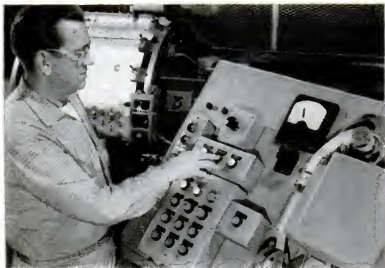




## Builder Flies Full-Scale Model of 1917 German Fighter

Following the original plans, obtained from the British Admiralty, Edward Brennan of Fairview Park, Ohio, has assembled a full-scale model of a Fokker D-7. The replica of the famed German fighter plane of World War I has been flown several times by Brennan and, he reports, it per-

forms admirably. The power plant is a 175-horsepower Ranger engine from a Fairchild PT-19 trainer, instead of the original 160 to 180-horsepower Mercedes. A modern fuel system was installed to conform with current regulations. Otherwise, the plane is as primitive as the 1917 version.



## Roll of Punched Tape Runs Automatic Welder

In the same way a player piano makes music from the holes in a roll of paper, an automatic welding machine at the General Electric plant in Everett, Mass., is operated by a roll of punched tape. The holes in the tape form a code which gives the machine all the directions and positions for welding up to 1600 spots in less than 90 minutes. The automatic welder is expected to save \$26,000 a year in the manufacture of jet engines for the armed forces.



## Berkeley Sports Car Now Has Hardtop Model

Tiny and simple, the British Berkeley continues its original design with a more powerful model. It comes as a hardtop or convertible. New is the three-cylinder two-stroke engine of 30-cubic-inch displacement. Top speed is 80 miles per hour. Front-wheel drive, four-wheel independent suspension and a four-speed transmission are other features. It's a favorite with members of the sports-car crowd who watch their pennies.

# It's Moving Day!

By F. Leland Elam

**WE ARE A NATION** on the go. The United States Bureau of Census reveals that one out of every five Americans changes his address each year. This means that 34,000,000 people move from one home to another taking their household goods with them or storing them.

When people move they see the things closest to their hearts, the things they live with every day—the tables they eat from, the beds they sleep in, the clothes they wear—disappear down the highway and they wonder if they will ever again see their possessions in good condition.

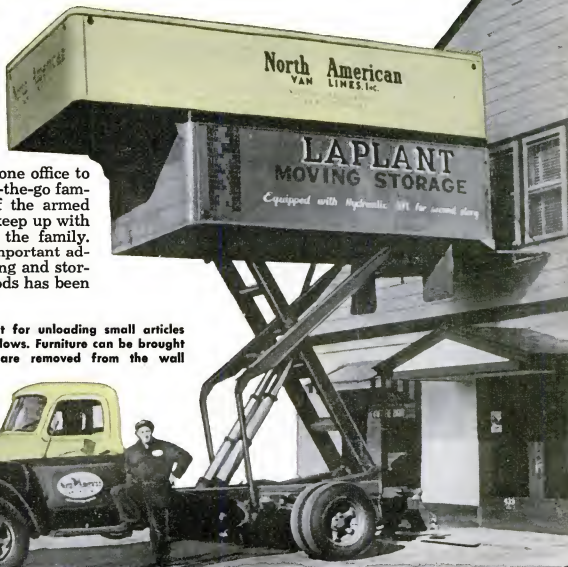
Today they need not worry. The development of "good housekeeping" practices in the moving industry, which annually receives \$204,000,000 from "people on the go," assures that household goods will reach their destination or be stored under conditions that protect them from harm.

The great demand for a mover's services is attributed to four reasons, all of which have pushed the industry into putting science to work to figure out proper-handling means: The increased availability of new homes, continued decentralization of industry, an expanding executive-training program in many fields which results in the shifting of key personnel from one office to another, and the "on-the-go families" of the men of the armed services who try to keep up with the breadwinner of the family.

One of the most important advances in the handling and storage of household goods has been



Piggyback Sea Van rides flat-bed truck and will be deposited in hold of a ship for trip overseas. One van can hold contents of a four-room home. Exterior is plywood



High-lift van lifts 14 feet for unloading small articles through second-floor windows. Furniture can be brought in if window sections are removed from the wall





Sturdy Sea Van is loaded easily and without damage onto a ship with big lifting boom. Here goes one family's possessions



This single van will hold 23 rooms of furniture. All five side doors have been removed to show portable vaults set inside

the adoption of portable vaults in which two to three rooms of furniture can be placed. Vault floors are made like pallets and this allows them to be moved about easily by fork lifts.

Important developments include a vault that can be used over and over, and one that has to be rebuilt for each user. The former offers maximum protection, its walls are solid, the door locks to keep out intruders. The latter is made of cardboard fitted to storage-load size.

The permanent vault's plywood or hard-board walls are completely smooth on the inside to eliminate any projections that might damage the contents. Framework is on the outside. The rigidity of the vaults allows storage to a height of two or three.

Cardboard vaults are patterned to the load. Furniture and other goods are placed in position with well-fitted vertical walls.

Giant pieces of cardboard are then squared around two thirds of the height of the goods and taped tight at the open end. A cap of cardboard is then slipped over the top to give a tight seal. Comparatively dustproof, it protects the load and keeps one person's household goods where it will not become mixed with that of another person. The average vault will hold furniture from two rooms.

This lighter-type vault permits an attractive and a clean-line appearance. It offers access to the goods without cumbersome handling. Its ready access appeals to the people who live in hotels, clubs or apartments and need extra space for their personal belongings.

Vaults are moved at floor level by short-lift forks. Latest models of such lifts have a foot-pedal lifting mechanism which requires only a few strokes to raise the forks to a maximum height of 5½ inches. The load is raised to a level position by the use of six lifting cams. Four-point suspension moves high loads without swaying while tandem rear wheels prevent sticking in floor cracks or elevator crevices and minimize swaying on rough floors. A rigid upright handle increases operator vision and reduces necessary aisle space.

The piggyback van has been introduced into two phases of moving. The demand of people for fast moving has brought it to air transportation. It has also met the demands for safety at a reasonable cost. It has overcome major problems in the moving of civilians to other countries to participate in overseas governmental work and families of the armed-forces personnel.

Shipping household goods by sea used to be a major task as each piece of furniture had to be strongly crated so that it would arrive in one piece. Poor crating often resulted in major damage.

Today, however, goods receive maximum safety. An effective palletized piggyback van without wheels that fits onto a flat-bed truck and into the hold of a ship, has been developed. The Sea Van is capable of carrying furniture from the normal four-room home. It is made of the thickest waterproofed plywood. Inside walls, floor and ceiling are smooth to assure there is nothing to scar the furniture. The outside is strengthened by sealing all edges with three-inch angle iron. The van is packed solidly so no item will move about. The



door tightly recesses into the box, and is locked. This van can take a beating and still protect the furniture. Also no one can get into it except persons having keys for the lock.

Movement of household goods by air-plane has been eyed by air-freight lines for some time. Only recently have economical and safe-handling methods been developed.

Slick Airways of Dallas, Tex., has developed a piggyback Sky Van. The key to this new moving operation is a lightweight, roomy aluminum container measuring 8 feet long, 5 feet wide, and 5½ feet high. Its base is palletted for easy fork-lift handling. Four of the containers can handle an average household, or about 6000 pounds.

Flat-bed trucks take them to the home where they are loaded while still on the truck. At the airport they are fork-lifted into the plane's cargo bay. To keep down shipping weight, lightweight furniture pads, and form-fitting refrigerator, stove, washing-machine and piano covers are used. The company requires a minimum of 2000 pounds per shipment, and a mini-

mum distance of 1000 miles. The householder can get coast-to-coast delivery in four or five days, and up to 2000 miles in three days. Overnight service to any city in the United States can be had by paying a special rate.

Aluminum sky vans give a minimum of vibration, loss, weather damage, and discourage pilferage. They accommodate huge pieces, yet fit snugly into a plane. They assure from 8 to 10 days faster delivery than by truck.

Two problems that have always plagued householders when they unpack their dishes were the shredded packing paper and the barrels. If you have never had to save a bunch of barrels for the moving concern until they came for them, you cannot realize how much of an annoyance they can become. These problems are now a thing of the past. Technology has developed the "clean pack" and containers that can be disposed of.

Clean pack is created by the use of corrugated cardboard and waffle cardboard. Squares of waffle cardboard are placed



Sky Vans are packed on flat-bed truck at home of family (left) then taken to airport and loaded by fork lift to freighter





Movers bring portable packing tables into the home equipped with racks that hold corrugated cardboard



A new spongelike soft paper eliminates bulky packing quilts and is ideal for wrapping framed pictures

between dishes, and corrugated cardboard is wrapped around a stack of five or six dishes and then stapled at the ends. The solid package fits neatly into a packing box along with others. Wrapping such large flat pieces as pictures has been simplified by using spongelike paper and bur-lap. They give excellent protection.

What is claimed as the largest moving van in existence was built for the Market Street Van & Storage Company of San Francisco, Calif. It will transport 23 rooms of furniture. Its over-all length is 50 feet—the box is 40 feet with a height of 9½ feet inside, and 9 feet wide. There are two skylights in the roof. Furniture can be stored as in normal-sized vans or in portable vaults. Five doors along one side can be completely removed to open up most of the side so vaults can be set in or removed by fork lifts.

Moving goods into a second-floor apartment takes a lot of back-breaking labor. Merrill J. Laplant, of Keene, N. H., built a moving van on which the box can be lifted to a height of 14 feet, allowing it to be placed at second-story windows in a position for unloading small articles. By removing window sections furniture can be taken in at second-floor level.

A new palletized trilevel vault for upholstered goods has been developed by the General Van and Storage Company of St. Louis, Mo. This vault is used both for unit moving and for storage. The upholstery container enables the operator to eliminate old-fashioned, space-wasting stationary rack structures. It takes but a few minutes to move one container to the loading area and place it on the van. The heart of the new container is a three-level rack attached to a 7½-foot by 42-inch pallet base. It is open at both ends, so workmen may enter to place upholstered goods on the rack.

It takes a lot of work to keep 34,000,000 people on the move each year. The Census of Business reports there are 1828 establishments primarily engaged in moving and warehousing household goods for the public in the United States. It takes 27,616 persons to handle the work load of these firms which have available 51 million square feet of dry floor space, and two million cubic feet of refrigerated space.

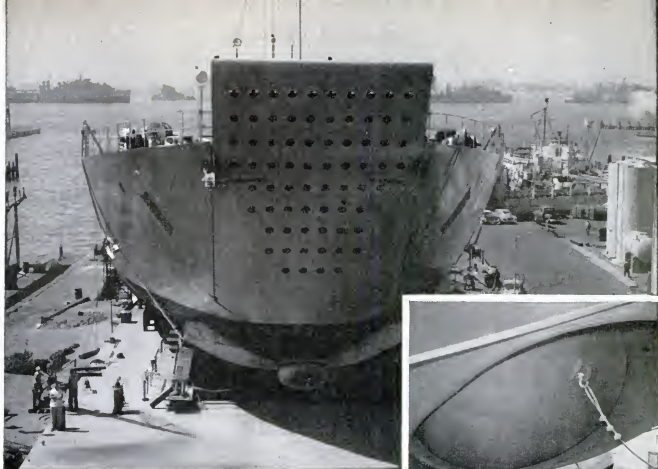
The last 65 years have seen more development and change in man's living conditions than the previous 20 centuries. Modern phases of this development are bringing assurances of the safe keeping of nomadic man's prized possessions. ★ ★ ★

## Copters Retrieve Targets

Helicopters are used by the Air Force and the Navy to recover downed jet-target "drone" missiles in remote areas of both land and water. Previously, they used crane-equipped trucks and patrol boats. The Air Force carries the drones underneath their helicopters in a special cable-harness device. The Navy picks them out of the water with a hook.

## Barnacles Get the Heave Ho

Shipowners in Sydney, Australia, will score big savings through an electronic device that prevents barnacle growth on steel-hulled vessels. The device does the job by sending supersonic waves through the hull. It has been tested successfully for a year on a vessel whose owners saved at least \$500 in docking and fuel costs each time she hit dry dock.



## Landing Craft Pushes Self off Beach

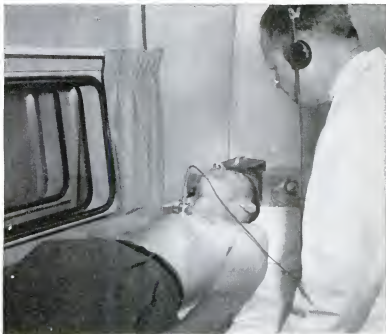
Mounted at a 45-degree angle to the deck of a new type of rudderless Army landing craft is a four-ton hydraulic ram which enables the ship literally to beat its way off an enemy shore. The ram rains fast and powerful blows on the beach, breaking the suction of sand and mud on the hull.



## Car-Engine Tool Becomes Supersensitive Heart-Murmur Detector

From a sensitive device used to measure automobile-engine pressure, doctors and General Motors technicians have developed an instrument to aid heart patients. It can detect and record heart murmurs so faint

that they are inaudible to conventional recording instruments. The patient is placed in a soundproof room when the instrument is used. It can detect chest-wall movements as small as one-half billionth inch.





# V II WHAT'S NEW FOR Your Home

**PORTABLE WATER SOFTENER** can be attached to any faucet. It weighs 10 pounds when loaded with 8 pounds of water-softening chemicals, sufficient to process 576 gallons of 10-grain hard water. The softener can be regenerated by pouring a gallon of water containing  $2\frac{1}{2}$  pounds of salt through the top.

Atlas Distributing Co., Inc., 3723 Wilshire Blvd., Los Angeles 5, Calif.

**STEPLADDER GRIPS** put you within reach of the higher places around your house. Made of strong, rustproof tubing, the grips add 14 inches to the height of your ladder and guard against accidents caused by loss of balance. The grips fit every type of stepladder—large or small, wood or aluminum.

Fred J. Chlupp Associates, Inc., 606 W. Wisconsin Ave., Milwaukee 3, Wis.



**SERVING FRAME** made with spiral spring stretches to fit hot dishes of many sizes and shapes. The spring dissipates heat rapidly, insulating the dish from the table. Used to hold a platter, the frame eliminates damp spots. It has a hammered-copper finish and comes with polished hardwood handles.





**ELECTRIC GRIDDLE** can cook food and be used as a table server and food warmer. Operating on a 110-120-volt alternating current, the griddle has a surface of 200 square inches, enabling a housewife to cook two or three foods simultaneously. It can grill 15 hamburgers at one time

West Bend Aluminum Co., West Bend, Wis.



**SPRING DOOR ELECTRICAL BOX** designed for surface mounting provides safe, simple duplex outlet operation in any area exposed to the elements. Electrical wires enter the box through a rubber grommet. The box, made of aluminum, can be quickly and easily mounted on any flat surface

Pass & Seymour, Inc., Solvay Station, Syracuse, N.Y.



**SPILLPROOF PLASTIC CUP** helps children bridge the gap between nursery bottles and open drinking containers. This tough, flexible tumbler has a snap-on lid with a spout through which the liquid is sipped. Perforations in the mouthpiece are small enough to prevent free flow of liquids, but they will pass them when slight pressure or sipping action begins

Pastry Corp., Fisher Bldg., Detroit 2, Mich.

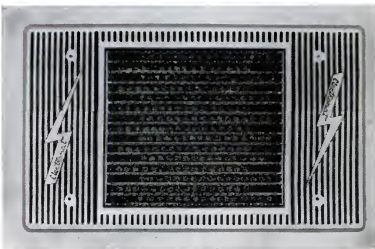
**HOME BARBERING AID** fastened onto scissors combs the hair and holds it between the blades for easy snipping. The device enables home barbers to have one hand free to hold child's head. It comes together with shears, plastic cape, and an illustrated booklet on home barbering

Ray Products, 250 Strader Ave., Cincinnati 26, Ohio



**ELECTRIC DOOR MAT** automatically brushes dirt from soles of shoes. As mat is stepped on, 15 brushes go into action in opposite directions. A 1/4-horsepower motor powers mat on 110-volt, 60-cycle alternating current. Mat is installed flush with floor, in well 29 inches deep

Electromat Co., 222 Charles St., River Rouge 18, Mich.





Intercom system linking house with movie-viewing room lets Basches monitor children's room while watching film. It also lets family know when movie is about to start. Car-type speaker, below, has been replaced with an 18-inch hi-fi speaker



## They See Drive-in Movies From Their Own Home

HOW WOULD YOU like to have a drive-in movie theater in your back yard? Bill and Rose Basch of Los Angeles love it. When they bought their bungalow and found 1000 cars on the other side of their patio every night, they thought they had blundered. The neighbors had planted tall hedges along the back of their lots. But Basch decided to turn a potential nightmare into a dream. He asked and received permission from the theater manager to tap the sound cable. The theater sent its own technicians over to install an audio cable in the Basch's back yard and charged only for the cost of materials. Basch then built a six-seat family theater on one end of the garage. The private movie viewing room, which cost about \$500, is pine-paneled and has an acoustical ceiling. To minimize reflection, Basch installed thick, polished plate glass that's crystal clear. He bought a half-dozen used theater seats and installed an 18-inch hi-fi speaker. Now the Basches can watch two first-run movies each week without leaving home.

Drapes pull across big windows when Basches want privacy. Popcorn source is drive-in stand on other side of fence





## Stream of Air Powers Electrostatic Filter in Air Conditioner

Dust, pollen and smoke particles are removed from the air by a small electrostatic filter concealed in one of the new air-conditioning units. The filter, according to the manufacturer, attracts tiny particles like a magnet rather than merely trapping those large enough to be caught in holes. The air stream turns a fan which, in turn,

powers the filter's own generator. The filter can be cleaned by washing it, and it reportedly does not produce ozone. Another of the newly introduced air conditioners is a room-size model of the reverse-cycle heat-pump type. It has an automatic defrost device which permits it to be used even in winter temperatures.

## Milk by the Chunk Served Canadian Army

"Eight inches of milk coming up!" That could be the way an order is filled at the Canadian army's station at Fort Churchill, Man. Milk to be shipped to the post is quick-frozen at —45 degrees F. The solid blocks of ice then are sent to the post in refrigerator cars. There the camp cooks saw the blocks into pieces of the desired length. Thawed for a few days at room temperature, the milk tastes as fresh as the day it came from the dairy.

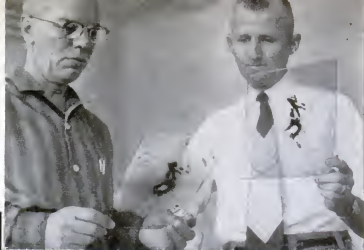


## Portable Aluminum Torches Make Patio Parties Brighter

For beach or patio parties, camping or just as a yard decoration, the new outdoor torches do a double job of providing portable lights and repelling insects. A special safety fuel contains an insect repellent. It also produces an extra-bright orange light and gives off what is described as a "scented South Seas aroma." The torches are made of aluminum with a finish that needs no polishing. Three-foot lengths of metal poles are supplied with the torches.



L. F. Conover, left, and H. W. Hiser, right, examine photographic negatives of rainfall recorded by radarscopes at University of Miami laboratory. Center photo of radarscope print shows storm over Florida Everglades that would miss most rain-gauge stations in area. Hiser, at bottom, uses densitometer to measure intensity of rainfall indicated by negative





# Forecasting Floods by Radar

By Edward Dickson and Max Hunn

**B**ECAUSE RADAR CAN "SEE" rainstorms which otherwise might be unobserved, it can become the instrument for warning communities of flash floods. And it can be harnessed as an aid to flood forecasters along the nation's major river systems to enable them to make quicker and more precise predictions of flood stages.

Those peacetime uses for the war-born magic of radar are being explored by a team of researchers at the University of Miami in Coral Gables, Fla., through a study of rainfall measurement by radar and photography. Now in its third year, the project is being conducted by the university's Marine Laboratory and Radar Research Laboratory for the U.S. Weather Bureau.

By photographing what the radar sees, the researchers have found they can obtain a fast, accurate record of rainfall occurring at any point within 100 miles of the radar station and for any given period.

A graphic example of the radar's reporting ability was related by H. W. Hiser, research associate professor who heads the project, and L. F. Conover, research meteorologist who represents the weather bureau in the experiments. During one observation of the 30,000 square miles of the research territory, the photographic negative of the radar observation showed widespread rainfall in varying degrees through much of a 6000-square-mile area.

But, despite the location of 75 rain gauges in that area, rain actually fell at only one such recording station. This was an extreme comparison between a dense rain-gauge reporting network and the radar observation of rainfall. But it illustrates the more complete coverage possible by radar observations, researchers pointed out.

Rainfall can be located by radar in much the same manner that radar can find aircraft in flight. High-frequency radio waves transmitted by the radar unit are bounced back to the radar receiving unit after they encounter raindrops in the air. These echoes form a pattern on the radarscope. The greater the rainstorm, the greater the intensity of the echo and the greater the reaction on the viewing scope.

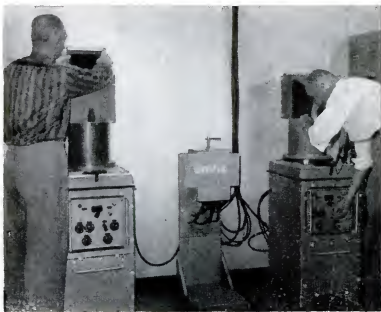
The researchers have put this capability of radar to work by time-exposure photographs of the echoes registered on the scope. And from the density of the rainfall echo pattern on the photograph, the researchers can determine approximate amount of rainfall at any point in the area.

Hiser and Conover believe radar can give fast and accurate rainfall measurements within its range of observation. Radar would be of particular value in detecting the dangers of flash floods. A flash flood may originate with a cloudburst in a sparsely populated area or in a section where communications are poor. A few hours later, a community is flooded without warning when a usually peaceful stream rages over its banks. Interpretation of the radarscope can alert forecasters to the development of any rainstorms which cause these floods.

Conover, a 22-year veteran in flood forecasting, believes rainfall detection and estimation by radar will be immensely valuable to hydrologists in calculating flood conditions along the major river systems by providing faster and more complete information than is now available.

The researchers use two 8 by 10 plate-back cameras mounted on radar repeaters. The photographic film can be used to record all rainfall echoes during periods ranging from one to six hours. After a photo is developed, it is examined with a densitometer. ★ ★ ★

Cameras supplied by weather bureau are mounted on radarscopes to make a photo record of any rainfall within 100 miles





## Briton Solves Parking Problem by Moving Big Car Sideways

Parking is a problem in England and one Britisher has invented a device to move a car sideways into tight parking spaces. Hydraulic jacks raise the rear wheels off the ground. With the engine running, the

rear wheels rub against the rubber disks that form the base of each jack, rotating them and moving the rear end sideways. To swing back out of the space, the transmission is put into reverse gear.



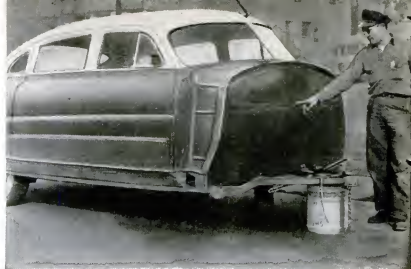
## Italian Solution Is Pint-Size Car

Italy has its parking problem, too, but it's no problem for Vito Pecori of Rome. He built himself a pocket-size car that he can park just about anywhere. It makes the normal small car in Italy (which is a nation of small cars) look huge. The engine is a 49-cubic-centimeter scooter power plant (about  $\frac{1}{100}$  as big as an average American engine).



## Mobile Overpass Speeds Servicing

Riding high is what the driver does when he operates a servicing unit designed and built in the shops of Fruit Industries, Bradenton, Fla. The mobile ramp is used to speed the servicing of refrigerator equipment mounted above the cab of semi-trailers. The driver sits on the working platform over the vehicle's engine and controls the unit by vertical extensions. Completely self-contained, the service vehicle carries engine-powered grease, air and fuel lines.



## Junker Made Into Inexpensive Weather-Tight Camping Trailer

By using a wrecked Hudson sedan, Ervin Padilla of Denver, Colo., built a lightweight, weather-tight camping trailer at a fraction of the usual cost. And, in addition, eliminated a lot of work. He paid \$20 for the body and removed everything from the

interior. A double floor of wood was laid with three inches of insulation between the layers. The bulkhead behind the rear seat was removed to provide a 10-foot-long interior. A stove mounted on the rear-window shelf is vented through a side window.



## Finns' Small Car Weighs 620 Pounds

Although it won't win any prize for styling, a new small car, the first to be made in Finland, is certainly one of the smallest. It is said to weigh about 620 pounds and to have a top speed of almost 50 miles per hour. Its engine, imported from Germany, is mounted in the rear. The car is called the "Wiima" and will sell for about \$940.

## Tiny German Car Goes Together Like a Frankfurter Roll

Although it is not yet in production, the German Mopetta has attracted considerable attention due to its plastic body that can be manufactured in two halves. Because of the ease of assembly, the cost will

be low. The small engine will be mounted in the rear and will give a top speed of about 50 miles per hour. The roadster-type body seats two persons and is said to have a comfortable suspension system.





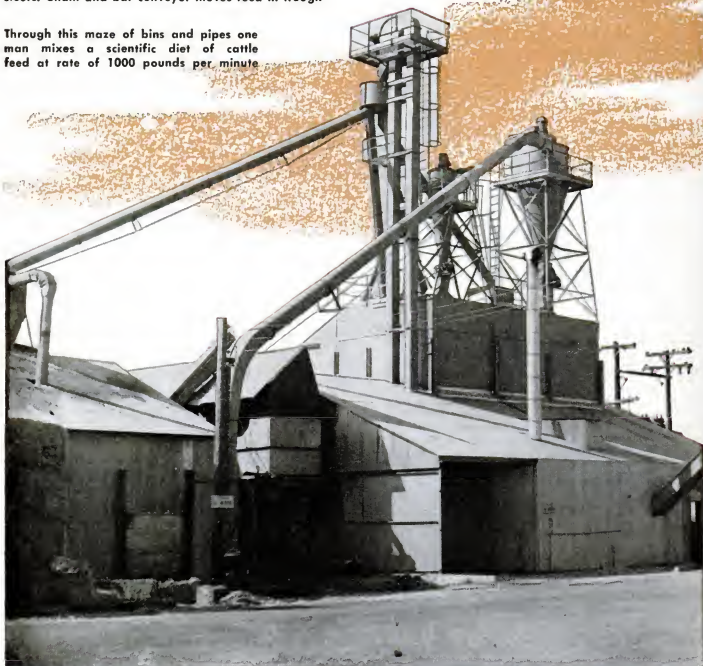


# Push a Button and You Make Beef

*By F. Leland Elam*

Dinner table as long as a city block serves 500 steers. Chain and bar conveyor moves feed in trough

Through this maze of bins and pipes one man mixes a scientific diet of cattle feed at rate of 1000 pounds per minute







Panel of push buttons controls all conveying systems that move feed to and from storage bins and mixers

**T**HE AGE OF AUTOMATION has arrived in the cattle industry and is turning out "push-button beef." The way it operates and the kind of beef it turns out are examples of a thorough application of modern technical knowledge. Beef today is raised to eat—not to double as shoe leather or armor plate as it often seemed to be in the past century.

Proper feeding of cattle by automation enables the cattlemen to control the grains he feeds. Thus he controls the texture of the meat, its vitamin content, the color and amount of fat, and its tenderness.

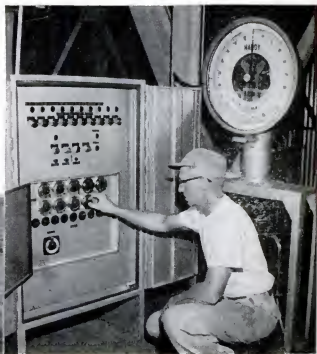
Back in the six-gun days of the 1800s and

the first half of the 20th century, if a man could ride a horse, rope a steer and pitch a lot of hay he had little trouble getting a job as a wrangler on a cattle ranch.

But as we advanced into the start of the second half of this century the picture changed. Today most cattle wranglers must learn a new language. They must know about proteins, total digestible nutrients, carbohydrates and concentrates, for they hold the secrets of making choice beef. Cattlemen must know how to figure out feeding formulas, and how to push a flock of electronic buttons to mix and feed those formulas. They are replacing spurs with throttles because they must handle big automatic feed-delivery trucks. They are turning from horses to horsepower.

Garrett Beckley of Linden, Calif., is one

Two sets of dials on panel below control the exact weight of each type of feed to be blended in mixer





Another method of feed delivery makes use of trucks equipped with augers that empty feed into yard troughs

of many cattlemen who have brought automation to cattle feeding. Under his system, three men feed 10,000 cattle faster than it formerly took 30 men to do the same job.

The operation is divided into two parts: Preparation of the feed, and presenting it to the animals. Feed preparation is handled by one man at the rate of 1000 pounds per minute—fast enough to produce in four hours enough feed for 10,000 cattle. The delivery of this feed to the animals is handled by two men.

Before automation it took a lot of men pitching hay and grain through 14 dusty and dirty hours each day just to feed a small herd of cattle. Automation cuts the required feeding time and the labor down to about one tenth and makes the old

"shovel-and-fork method" as obsolete as a crystal-radio set.

The modern mechanical way produces a fattened animal 90 to 120 days after he is brought in from pasture, where he has spent the first 18 months of his life. It raises him from about 600 pounds to a 1000-pound weight, ready for market.

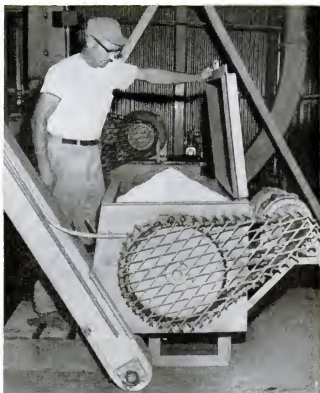
"Our meals to hungry cattle are always on time," Beckley says. "There is never any delay due to the slowing up of workers. The tons of necessary feed are mixed by one man pushing buttons and turning dials on two electronic control panels. Automation is as complete as we can make it."

There are 30 push-button stations on one panel. These buttons control electronically all the conveyor and elevator systems that

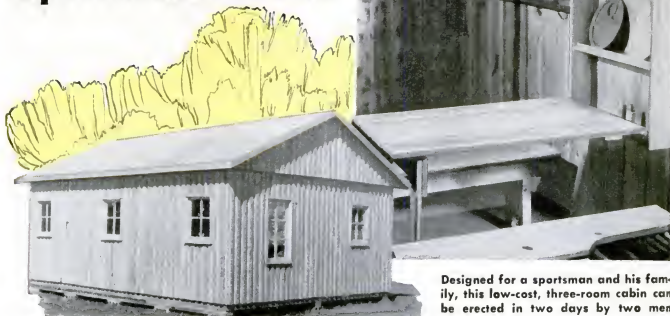
(Continued to page 228)

Each batch of scientifically mixed feed is automatically weighed and recorded as it's loaded into truck

Trace minerals, salt, stilbestrol and antibiotics are mixed in this hopper and metered onto conveyor



# Sportsman's Cabin



Designed for a sportsman and his family, this low-cost, three-room cabin can be erected in two days by two men

**YOU'VE JUST BOUGHT** a piece of land near your favorite fishing spot, and now you're going to fulfill the dream of your life: Retire, sell the house, leave town and spend all your time satisfying a mighty appetite for the sportsman's life.

"But what are we going to live in?" asks your wife.

One answer might be this economical, easy-to-build cabin, designed especially for hunters and fishermen and their families. Two men can build it in two days, at a cost as low as \$980. Measuring 16 by 20 feet, it's ideal for four or five men, an average-size family or two couples. The suggested floor plan provides for two bedrooms size 8 by 8 feet, a 20 by 8-foot dining and living area, and a 4 by 5-foot bath, utility or storage room.

One of the best-liked features of the cabin

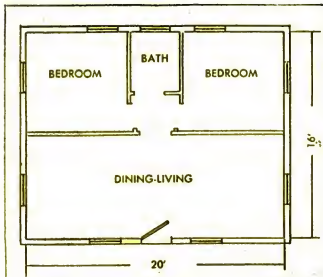
is its vertical log cabin construction. Made of Michigan cedar on the outside, it blends picturesquely into any woodland or lake setting. Inside the cabin, partitions are of knotty pine.

The cabin can be erected simply and quickly because every part of it, from floor to roof, is supplied by the manufacturer and marked to coincide with panel layout, instructions and blueprints. The panels are tongued and grooved for fast, airtight assembly, and the window and door panels are complete with glass. Even without insulation the cabin is draft proof because of the precise fit of the panels.

After spending a few days putting up his cabin, the sportsman can finish off the interior at his leisure. Materials for the partitions can be bought with the cabin or separately after it has been erected.

Since window and door panels are interchangeable, the cabin's suggested floor plan can be altered

Material used is factory engineered and soaked with wood preservatives. The cabin is draft proof







### Magnets Can Cook Food Without Direct Heat

Cooking time may be cut in half by a kitchen range developed in Germany that produces heat from magnetic eddy currents. The heat is not directly transmitted to the cooking vessel. A paper napkin can be placed between the pan and the heating surface and it will not burn or char. The range works only with pots and skillets made of a magnetic metal, and a copper coating makes them heat faster. The amount of heat is controlled by turning a knob which raises or lowers the surface on which the pan rests. The eddy currents generated by magnets also can be used to mix a milk shake on the range while other food is being cooked. A simple magnetic motor operates the mixer.



### Berlin's Open-Air Restaurant Heated for Year-Round Use

Attached to the main railway station in West Berlin is a second-story sidewalk cafe. Diners who want a view with their meal can eat on either of two balconies on the front of the station. The 300-foot-long open terrace is equipped with special heaters so that patrons of the restaurant can eat on the balcony most of the year.

### Wire Coated With Aluminum Promises Longer Service

Aluminum-coated barbed wire and farm fence, promising considerably longer service than conventional zinc-coated wire, is approaching the commercial stage after five years of field testing.



### Skin Diver-Miners Vacuum for Gold

Old-time gold prospectors would be startled by the techniques of a crew of modern California miners. Business-end of their gold dredge is a vacuum cleaner head, similar to those used in most American homes. The vacuum head is attached to a 40-foot length of two-inch hose. Gold-bearing sand is sucked into a steel drum containing mercury which separates the gold from the sand. The vacuum head is moved around the river bottom by a pair of skin divers.





Television camera in the body of the plane monitors wing-control surfaces, engine and flaps for pilots

## ***Pilots Watch Blind Spots With TV***

AIRBORNE TELEVISION is helping pilots to keep watch on their plane's troublesome blind spots. For example, a TV camera mounted under the plane's nose flashes a picture of the landing gear to the pilots. Viewing the wheels' position in relation to the runway helps the pilots, in cross-wind landings, to hold a low-wing attitude

Receiver shows relation of landing gear to runway. Coaxial cables connect remote cameras to receiver

until just a moment before touchdown.

Other cameras keep a close watch on tail and wing surfaces for icing, and on engines for fuel leaks, fires or unusual vibration. Airborne TV can withstand constant vibration and temperatures down to 65 degrees below zero. Camera focus is remotely controlled.

Protective plastic bonnet encloses TV camera on nose, which is focused on plane's landing gear





Bambo, a 30-year-old, 400-pound male gorilla at the Philadelphia zoo, prefers a nutritious diet cake (under his right paw) to natural meal of oranges and kale

# "K"

## RATIONS FOR THE ZOO

Photos by Don Honick

The animals eat cake made of grains, flour, yeast, oils, salt, meal, and milk. Each square weighs 25 pounds. Humans say the cake tastes like grass



**B**ANANAS and oranges and kale may be fine for some gorillas. As for Bambo, the 30-year-old patriarch of the Philadelphia Zoological Garden—give him a choice and he'll pass up those "natural" foods any time for the zoo's Diet A.

The recipe? Whole grain and legume meals, milk proteins, brewer's yeast, meat, minerals and vitamins.

### Pioneer in Animal Diets

For 22 years the Philadelphia zoo—oldest in the nation, founded in 1874—has pioneered a study of nutritional diets for its residents. Under the direction of Dr. Herbert L. Ratcliffe, who is also a professor at the University of Pennsylvania School of Medicine, the zoo's Penrose Research Laboratory has worked out a series of recipes—like the GI's K ration—that keep the birds and beasts and reptiles in finer



fettle than the natural foods they might import from the jungles of Malaya and the African veldt. Result: the animals live longer—like Bamboo, the gorilla, and Queen Bess, a dowager flamingo who's been around since 1914; and they raise more and healthier young.

#### **Eight Composite Diets**

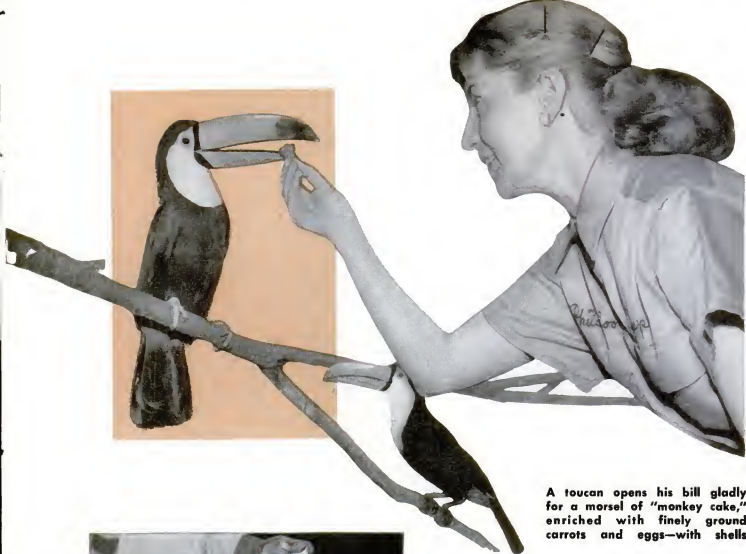
Naturally they don't all like the same menu, and at least eight composite diets have been evolved for various groups of animals. But a hummingbird will thrive on the same basic food elements as a bear, although its appetite is different. The cockatoos and parrots won't touch a "K ration" meal without some whole-seed additions. The big cats relish a slab of horse meat dredged with a mixture of milk powder, minerals and vitamins. Diet A, locally known as "monkey cake," is fine for a long list of zoo residents but the fellow with the big bill, the toucan, likes his better garnished with some finely ground carrots and hardboiled eggs—with the shells. The one group you can't sell on these newfangled cake rations is the fish-eaters. For them, it's fresh fish or nothin'.

"Our diet system has its basis in the established fact that all species of higher animals must have protein, fat, carbohydrates, minerals and vitamins if they are to

Only bars can keep this jaguar from going 100 percent of the way for a tasty feast of horse meat dredged with milk powder, minerals and vitamins

This male giraffe eats a modified ration suitable also for dairy cows. The diets mean longer, healthier lives and better offspring for the zoo animals





A toucan opens his bill gladly for a morsel of "monkey cake," enriched with finely ground carrots and eggs—with shells



An employee at the zoo bags a mixture of carrots, beet pulp, and kale for the diets of plant-eaters

live and reproduce," says Dr. Ratcliffe.

#### Mortality Rate Reduced

So successful has been the Philadelphia study of nutrition that the annual mortality rate among mammals, for example, has been reduced from 18.8 percent in the 20 years prior to 1935 to 11.0 percent since 1935. And the Philadelphia zoo methods have recently been adopted by the zoo at Basel, Switzerland, and are being studied at Antwerp, Belgium and Frankfurt am Main, Germany. ★ ★ ★

The rhinoceros feeds on Diet B, a modified dairy ration. The animals relish their special diets





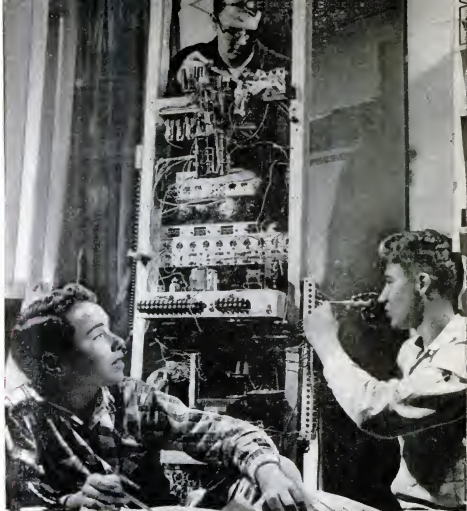
# Teen-Agers Set up a Phone System

HERE'S ONE SOLUTION to that age-old battle between teen-agers and parents over use of the telephone. Three enterprising youngsters of Berkeley, Calif. — John Davis, Tom Voorhies and Preston Thompson — set up their own phone system. The three lads provide service to 18 subscribers who think it's a fine idea — they pay nothing for it!

With equipment financed from their allowances, the boys worked in their spare time to set up the telephone network. Lines were strung from trees to poles to roofs. A switchboard was installed in one of the homes. Soon the service was a going concern, with all the problems of a public utility except taxes, which the boys don't have to pay since they charge no fee.

Contrary to most utilities, though, the boys hope for trouble in their system. When something goes wrong, they have an opportunity not only to run down the trouble but visit their friends while they're making repairs.

Today the company is a member of the California Independent Telephone Association. More important, the parents like the arrangement because it keeps the boys off the regular phone system.



Growing pains: Circuits in switchboard must be rewired to handle a new subscriber. Switchboard limits number of phones



Young linemen run line from a subscriber's home to main pole. Below, only chore they dislike is manning the switchboard. Someday they hope to convert to dial telephones

Repairmen look forward to troubleshooting visit to home of this subscriber





The next 15 pages are devoted to an informal way of life that started on the West Coast a number of years ago and has now swept across the entire country—outdoor living. It has affected the lives of millions of people as well as their homes and yards. It seems to us that the ideal space for outdoor living should adjoin the home and afford pleasure for the whole family—an outdoor family room. As a model for our readers, we asked Tom Riley to build such a room which is featured on the first six pages of this outdoor-living section.

## We Built a

By Tom Riley

**O**FTEN, my wife and I (and our small son, too) looked out on our rear yard and wished we knew what to do about it. Like so many California homes, ours had an open patio or terrace in back. And like so many such slabs, it baked you in the summer and in the winter it was soggy and cold.

Then *Popular Mechanics* asked me to test-build a good example of an outdoor room. It would have to be adaptable to most any home and climate. It would have to answer most any problems and desires.

My family leaped into this. (Wasn't our own rear yard an example of the need?)

We started looking at outdoor rooms in earnest and literally saw hundreds. Finally, we found one outdoor room which was good. It was far too expensive—on a home that most of us could never afford—but somehow it was practical and right. It was designed by Rosalind Wheeler, a San Francisco landscape architect.

We asked Miss Wheeler if she would design the adaptable and inexpensive outdoor room we needed. Her answer was an enthusiastic "Yes!" She agreed that construction of an outdoor room was easy but that far too often it didn't accomplish what it should. She mentioned that she had been

Before the outdoor room was added, the rear of the Riley house had a sun-baked and seldom-used patio





Jokey roof of the outdoor room was designed to let in more light; it protects grill, tables, even the TV

# *Family Room Outdoors*

Strategically placed lights glamorize room at night as guests sit around fire in "wishing well" grill







Crank at side of circular barbecue raises or lowers grill. Bricks were built up around portable grill. Attractive metal hood and stack carry smoke away

Special feature of barbecue cabinet and counter is the warming shelf which pulls out like a drawer. It was made from tray with glass heating panel in top



working on the answer for years and believed she already had it on paper.

These pages show the results. In one month, with a neighbor helping on the framing, I built the outdoor family room to Miss Wheeler's specifications. It adapted perfectly to our house and our desires, as it can to yours.

Your house influences the exact size. We made ours 14 by 29 feet, not counting its roof overhang. Miss Wheeler advises: "Don't be afraid to make the room big!"

The house also influences the location. We decided to build ours in front of the sliding glass doors of our dining room. With those doors wide open, the outdoor room becomes fully a part of the house. We also extended the outdoor room to the left to protect an entranceway from the rain, and past the kitchen window on the right so the window could be used for a pass-through.

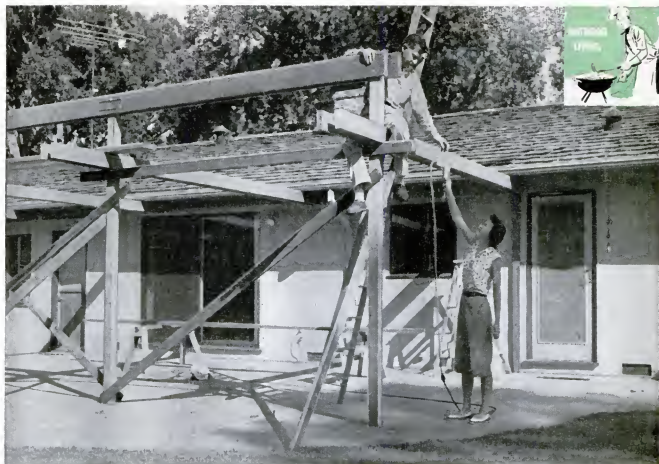
The framing of this outdoor room allows you to run a flat, narrow roof out to either side—for protection of other doorways or for architecturally tying in the room to the rest of the house. We took advantage of this possibility to run such a soffit extension off the left side to our garage.

The major part of any outdoor room is its roof. Our roof is a butterfly design and slants up from the house. This has several advantages. It attaches easily and looks better on most houses. It extends just slightly over the house gutters and drains into them, which means no extra gutters or flashing into the house roof. And you can build it high! Ours is 10 feet high at the top of the front posts. The important



Corrugated Flexboard roofing was easy to nail down. Lighter section nearest house is translucent glass fiber which helps light interior of house as well as the outdoor room. Riley used 12-foot lengths of the Flexboard and 3-foot lengths of skylight paneling





During framing operation, Riley (sitting on double two-by-six joist) reaches for drill hoisted by his wife

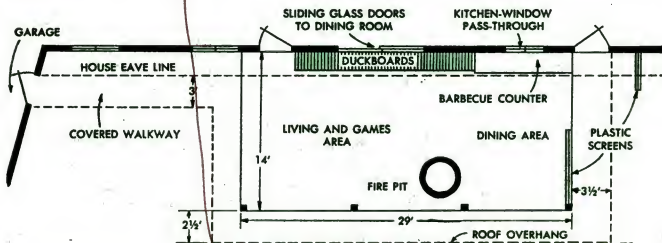
thing is to be able to see the horizon and a little of the sky when looking out the windows. Then your room will not take all the light from the house. Also, it seems to bring the outdoors into the home.

The roofing is made of Flexboard, a lightweight corrugated-asbestos-cement panel. I'd never heard of it but found out that this material has been used on the roofs of commercial buildings for almost 50 years. It is as easy to nail down as glass fiber, yet is strong enough to walk on. It's insulating, fireproof and, best of all, costs only about one third as much as many good-quality roofing materials.

On most houses, and ours was no exception, even a butterfly roof would darken the house to some degree. So we included a skylight strip. The roof framing of the room is a conventional egg-crating of two by sixes. Over the last section adjoining the house, clear corrugated glass fiber of the same-size corrugations as the Flexboard was laid. The plastic is not as clear as glass and we've found that this gives an excellent, soft lighting to both the house and the rear of the outdoor room.

In the suburbs of San Francisco we have no insect problem so we built the outdoor room without screening. But what our

General plan of the outdoor room shows how it connects to dining room, kitchen and with walkway to garage

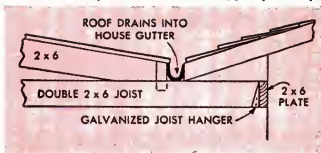
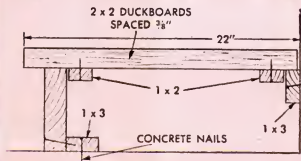




Riley puts finishing touches (trimming off and smoothing) to the completed roof frame—biggest part of job



Duckboards provide out-of-the-way seating for guests as well as space below for storage



room did need—a fairly typical case—was to be closed off at one end for privacy and wind protection. We erected a screen directly behind the barbecue table, a two-by-four frame containing two 3-foot panels of clear, flat glass fiber. A similar screen containing one panel of the plastic was attached to the side of the house beyond the outdoor room just past the kitchen door. Thus, a baffle was formed which did the job perfectly, yet in no way blocked off or enclosed the outdoor room. In the same way, if you are screening the room, you might substitute the glass fiber, or inexpensive plastic-coated fly screen, at one end for more privacy or a wind baffle. If you leave the room open and have young toddlers, you can attach accordion-type gates to the posts and house and have a huge playpen.

One possibility my wife hoped for was an outdoor room which would furnish seating and entertainment for a sizable crowd without expensive furniture and built-ins.



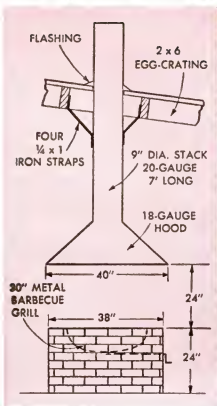
On a summer night the outdoor room can be quickly converted into a theater for viewing slides or movies

We'd seen too many examples of outdoor rooms cluttered with expensive chairs and lounges and no elbow room. We decided on duckboards made into a long, low bench extending the length of the room against the house wall. The bench's height is the

same as the doorsills of the house. On one end we placed the barbecue cabinet. Adding a few inexpensive pillows to the bench provides seating for a good number of people. The duckboards also are a safe place

(Continued to page 234)

Detail at left shows how barbecue stack was suspended from roof and fireplace built; right, grill is guide





Roof-top patio of Jack Lind home has area of 24 by 27 feet plus deck walk. The floor is one-inch-thick concrete poured on  $\frac{3}{4}$ -inch exterior-grade plywood. Ground-level view, below, shows carport beneath patio





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CALIF.

## OUTDOOR LIVING

on a garage or carport roof can solve the patio problem for many people with small yard space. Roof patios are gaining in popularity in California where many homes are built on steep hills, which further limits the amount of outdoor-living space. The addition of a roof-top patio to an older house often calls for a bold manner of execution. The Hugh Henes family, of Piedmont, Calif., had a small lot on a hill. The only rear-yard area was used as a driveway to the garage, which was under the house, and as a turning area to get into and out of the garage. To get the outdoor-living area, they built a two-car port out from the rear of the house with a garden deck on the roof of the carport. An entry was made to the deck from the main living area and a stairway was built at the other end of the port. Besides gaining a roof patio, the Henes family now has more room for their cars. The original garage has been converted into a storage area. Although the patio is 12 feet above the ground, partly covered by vines, eliminates the feeling of height and gives added privacy. A roof-top outdoor living area was included in the original plans of the Jack Lind home in Los Altos, Calif. The split-level hillside home has a two-car port extending from the recreation room. The carport roof, at the upper level, is covered with concrete. ★ ★ ★



Outdoor-living area on roof of Hugh Henes carport is 12 feet above ground but gets garden look from vines on fence and tubs of flowers and shrubs. Patio floor is concrete panels with two-inch redwood dividing strips. Sunlight and shade are controlled by overhead canvas panels





Working evenings and week ends, with a budget of \$175, the Warren Morrisons built this compact patio on a lot 20 feet wide and 30 feet long. The roof framing is construction-grade redwood finished with sealer

## OUTDOOR LIVING ON A

Cinder-block center island is arranged in angular U-pattern. The middle section is used as a buffet and the lower, end sections are used as extra seats. The coffee table was made from scrap pieces of redwood



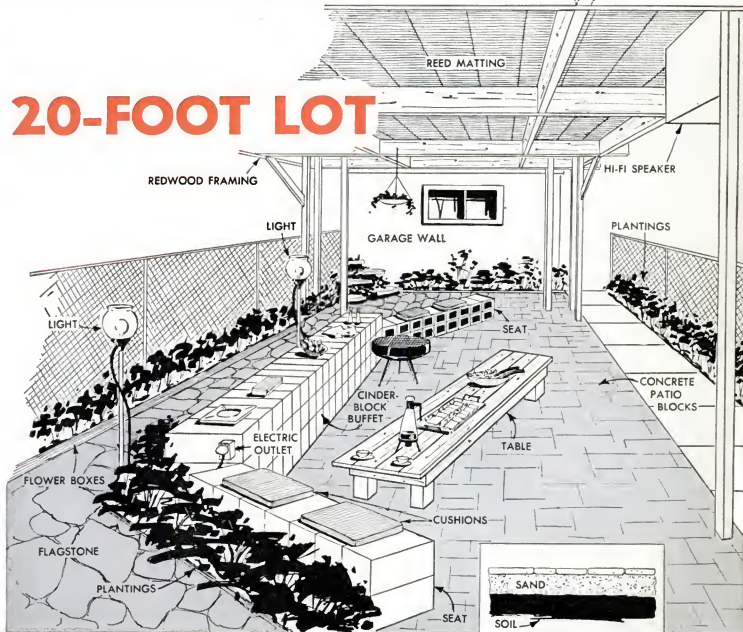
**WHAT CAN YOU DO** with a small city lot? When Mr. and Mrs. Warren Morrison finished building a garage behind their town house in Chicago, they found the back-yard had been whittled down to an area of 20 by 30 feet—about the size of a large living room. The yard was carpeted with a fine growth of bluegrass but the Morrisons wanted an outdoor-living area where they could relax at the end of a warm day, barbecue a steak, entertain friends or just listen to hi-fi records. They decided to dig up the grass and convert the entire yard into a patio. The Morrisons donated most of the sod to a friend, saving a couple of tiny patches for outdoor “decor.” Part of the topsoil went into wooden flower boxes built along the fence. The rest was saved to nourish plants later set around the center island of the patio. The “scalped” yard was covered with a four-inch layer of sand, rolled and graded so water would drain into the alley. Next came the foundation for the cinder-block

center island, built in an angular U-pattern. Flagstone and concrete blocks were laid on the sand and the cracks between were filled with dry mortar mix. The patio roof was built of construction-grade redwood, with corner posts set in concrete two feet deep. Morrison later leveled the post tops with a power saw. The roof is covered with strips of German water-grown rush stitched together with stainless-steel wire. It can be rolled up and stored during the winter. Electric outlets on the island are wired to the garage circuit and the hi-fi speaker is connected to a player inside the house. The Morrisons did all the work themselves, using evenings and week ends over a period of five weeks. Materials cost \$175. ★ ★ ★

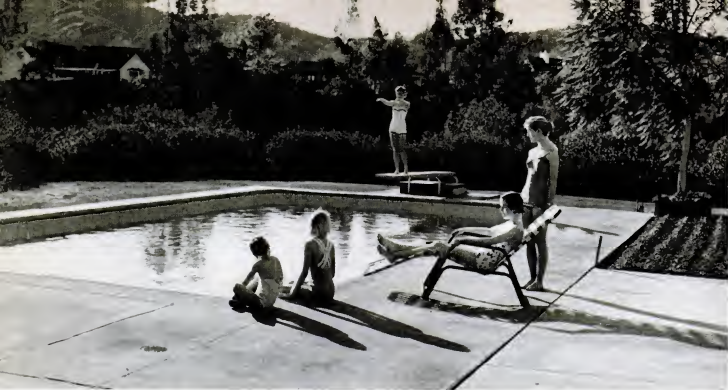


Diagram shows plan of the patio. Flagstone and concrete patio blocks were laid on four-inch sand layer

## 20-FOOT LOT







Hillside pool in Los Angeles measures 18 by 30 feet and takes up most of yard. Steep cliff is behind shrubs

## Three Pools for Small Lots



This pool was built at the rear of a yard in a modest neighborhood. It is 16 by 32 feet. The yard is fenced

LUXURY? Sure. But so is that second car and that new TV set. It all depends on how you want to spend those extra dollars for recreation and just plain fun. More and more families with small lots are installing swimming pools every year. Some of them are do-it-yourself projects but most are professional jobs. Yards with pools require enclosures or natural barriers of some kind to protect them from trespassing children. The enclosures also provide privacy. The small-yard pool with its surrounding patio is not only a delight to every member of the family but reduces yard maintenance to a minimum. If the pool patios are close enough to the house they can also be outdoor-dining areas.

Kidney-shaped swimming pool 16 by 30 feet set in tiny yard made this house a hit at Houston Home Show





# TOOLS FOR YOUR YARD AND GARDEN



## Power Mowers

Rotary or reel, both save work. Reel shears, makes smooth lawn; rotary cuts weeds, tough grass



## Round-Point Shovel

Helpful for digging in hard or clay soils. Blade should be made of tough and tempered steel



## Spading Fork

Sharp tines penetrate soil easily; more efficient than spade except in soils that are sandy



## Rakes

Garden rakes spread fertilizer, soil. Lawn rakes need flexible teeth that won't harm roots



## Narrow Trowel

Makes rows for seeds, small holes for small plants; can be used as weeder in flower beds



## Lawn Roller

Helps you maintain a smooth lawn, levels frost upheavals, improves germination, rooting



## Aerator

Permits moisture, air, nutrients to penetrate soil freely by making soil porous and loose



## Power Tiller

Prepares soil for lawn seeding or gardening. Pulverizes old plants and soil into fine mulch



## Lawn Sweeper

Removes sticks, stones before mowing, stands grass shoots up for even cut, gathers clippings



## Garden Cart

Moves small loads of soil, sand or fertilizer. Dip front down and scoop leaves into hopper



## Wide Trowel

Helpful for taking up and planting larger bulbs, potted plants. Proper handle is very important



## Hand Cultivator

Lightweight, about 18 inches long, for close work in weeding and tilling soil around plants



## Weed Knife

Also called dandelion knife. Blade slides under plant crown to remove weeds or wild grass



## Hose

Larger diameter moves water faster. Some plastic hose sensitive to sunrays, temperature



## Sprinklers

Consider water pressure, land contour, soil type. New lawns, some flowers require fine spray



## Wheelbarrow

For heavy duty hauling jobs around yard. Usually has more capacity than a garden cart



## Lawn Spreader

Distributes commercial fertilizer, grass seed or top dressing on lawn quickly and accurately



## Pressure Sprayer

Holds several gallons of spray to control weeds, insects and plant diseases in your yard



## Hedge Trimmer

Cuts woody growth, controls shape and size of shrubs. Also trims grass missed by mower



## Pruners

Cut back stems of tender flowers as well as tree branches. Long pole type is for tree tops

# A YARD is FOR FUN

ONE OF THE MOST popular reasons for living in a house with a yard is, "so the children will have room to play." But, too frequently, the yard is a well-manicured plot of grass and flowers and the children do most of their playing on the sidewalks and streets. You don't need a lot of yard space for a playground. A big swing set requires about 70 square feet of area. Some playground items will fit into a corner of 50 square feet or less. So you can still have your roses and blue grass and the youngsters can learn that "a yard is for fun." In fact, a yard today can be more fun than ever before because of the imaginative types of apparatus available. New this year, for example, is a giant jungle gym made from 150 one-inch dowels. There's equipment for lazy-day play and some that will absorb all the energy a child can exert. ★ ★ ★

All the youngsters in the neighborhood will fit on a jungle gym that gets its strength from the geometric arrangement of dowels. Inset shows how they lock



It's a tree, the mast of a pirate ship, or maybe a pole firemen slide down. It's called a Poplar Tree and is designed to meet the climbing demands of boys and girls



Also for small "muscle men" is a Playweb Magic Carpet which allows a child to climb freely in any direction and at any angle on metal rungs



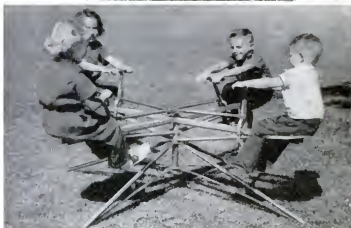


Aluminum-and-plywood Playframe is easily adoptable as a playhouse, spaceship or office

One or more can play on this teeterboard, sitting or standing. Five-foot wheels are made of enameled aluminum pipe



This is called a Rock-It and that's what you do with it. It's the right size for small yards



By pushing and pulling the handles, two to four children can have hours of fun on this pint-sized merry-go-round

There's plenty of rock and roll on a giant bowl made of aluminum pipe. You also can turn it upside down and climb all over it

Photos by  
Lew Merrim, Barbara Paine,  
Universal Mfg. Co.





Clotheslines, trash burners and other utility items can be hidden from patio view by an attractive screen

## Screens for Pools or Patios



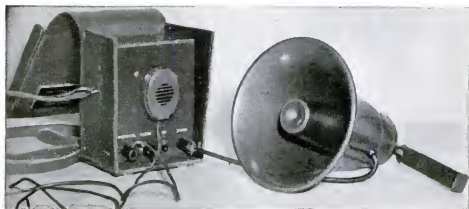
Do-it-yourself patio screen, above, was built with rough redwood at a cost of about \$34. Panels are opaque glass fiber or stained lath. Pool screen, below, uses "reject" picture windows



WHETHER YOU WANT privacy, a windbreak or an outdoor-area divider, you can make an attractive addition to your yard with one of the new patio screens. They're simple to construct and generally much less expensive than they look. The large screen shown at the top of the page was built at a cost of \$42. It's 28 feet long, 7 feet high and its purpose is to hide the utility area of the yard. Except for cellulose-acetate-coated panels at the top, redwood is used throughout. The vertical posts are, alternately, 4 by 4s and 2 by 4s. The basket weave is made from  $\frac{1}{2}$  by 2-inch redwood strips. The 12-foot privacy screen, in the center photo, was built around a brick patio planter for \$34. All the lumber is rough redwood. The framing consists of alternate 4 by 4s and 2 by 4s vertically and 2 by 4s horizontally. The light-colored panels are corrugated glass fiber. The dark panels are made of two-inch lath. The more ambitious windscreens around the pool, bottom photo, was built by the homeowner from "reject" picture windows sold by a manufacturer at a fraction of their regular cost. The frames were fastened to posts.



# Radio TELEVISION Electronics



## Build-Your-Own PORTABLE PA SYSTEM

By Thor Goodman

Battery-operated, portable, this low-power PA system is rugged, dependable

**H**ERE IS THE do-it-yourself version of a commercial outdoor PA system which is easy to build and proven in performance. Originally designed by Dorsett Labs.\* for the University of Oklahoma, the unit was first used by field parties studying geology and proved to be highly efficient even over rough terrain and in rainy weather—the poorest operating conditions.

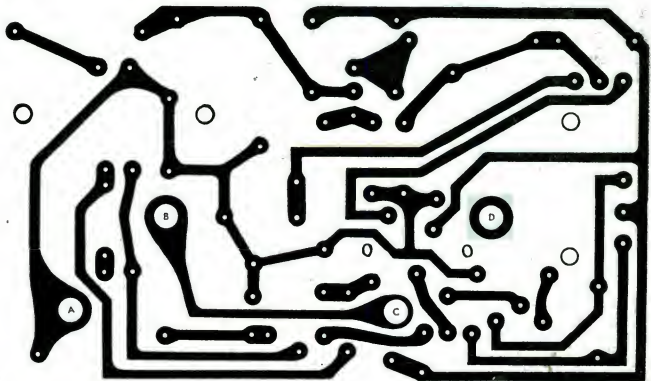
Containing a transistorized amplifier, this PA system offers greater power and intelligibility than previously available low-cost “power megaphones.” Its rated power output of approximately 500 milliwatts, driving a highly efficient trumpet

speaker, permits ordinary speech to be heard clearly over 500 feet away.

Construction is simplified through the use of a commercially available printed-circuit board (Model 50, Dorsett Labs., Norman, Okla.) which eliminates most of the tedious point-to-point wiring of conventional circuits. A full-scale drawing of this board appears in Fig. 1 for the more experimentally inclined hobbyist who may wish to make this himself from materials available from leading radio parts distributors. Alternately, standard wiring procedures may be used by mounting the small

\* Dorsett Laboratories is primarily a producer of telemetering and control equipment for aircraft, guided missiles, petroleum industries

Fig. 1. Full-scale drawing of commercial printed-circuit board on which all small parts will be mounted





The battery spacers are made next, using  $\frac{1}{2} \times \frac{1}{4}$ -in. aluminum stock. The lengths of these may be changed slightly to obtain a flush fit in the case as illustrated in Fig. 4. Use the mounting holes in the case as

Now study the drawing of the printed-circuit board and note the four holes labeled A, B, C and D. These must line up with similarly spaced holes in a  $5\frac{1}{4} \times 3\frac{1}{16}$ -in. Bakelite board, as shown in the mounting detail of Fig. 2B. To assure proper alignment, place the printed board on top of the Bakelite one, printed side down, and carefully mark the location of these holes on the Bakelite board. The remaining four holes in the Bakelite board must be aligned with the tapped holes in the battery spacers to which the Bakelite board will be fastened.

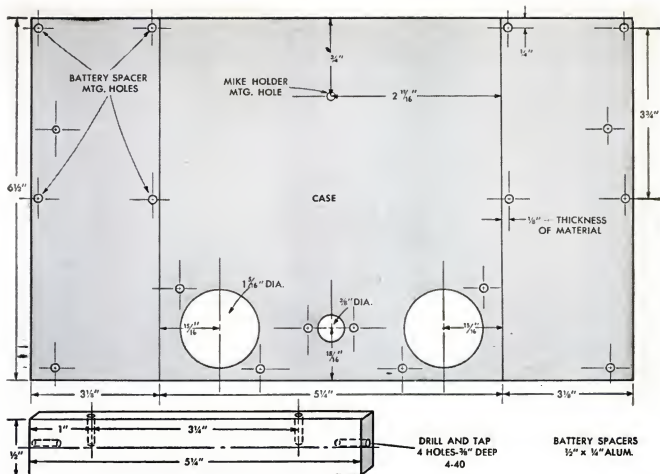


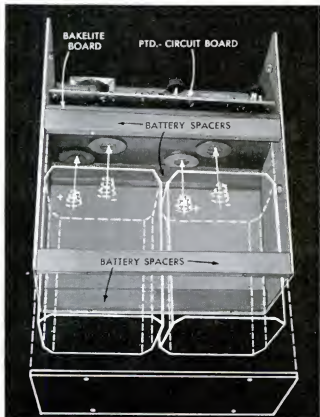
Fig. 3. Case layout and construction details for battery spacers. See text for special instructions

Soldering the small parts to the printed-circuit board is the next step. The parts must be placed on the plain side of this board and their leads soldered to the printed foil underneath. Since this board is semitransparent, the foil pattern can be seen through the top, as in Fig. 2A, by holding the board to a light. This will help you to thread the component leads through the correct holes. Use a small-tipped soldering iron, or gun, in soldering the connections and carefully avoid solder shorts between adjacent foil strips. After soldering, any excess lead lengths may be trimmed off.

The transistors are the last parts to be soldered in place, and special care should be used in their installation. The transistor leads should be left long and covered with "spaghetti" so that only the ends of the leads protrude through the bottom of the board. Soldering should be done as quickly as possible to prevent excessive heat from damaging these units. Make sure, also, that the transistor leads are inserted in the correct holes. Note the close spacing between the emitter (E) and base (B) leads and the greater separation between the base and collector (C) leads in the pictorial diagram and install these units exactly as shown.

Finally, be sure to install the wires which eventually will be connected to the

Fig. 4. Final assembly. Batteries fit snugly between spacers. Spring-connectors contact brass washers



parts on the case (J1, J2, R2 and SW).

After the printed-circuit board is completely wired, fasten the previously drilled Bakelite board to the battery spacers and mount the components board above the Bakelite one as shown in the mounting detail of Fig. 2B. The two boards should be approximately  $\frac{3}{8}$  in. apart and the height of the metal spacers separating them should be chosen accordingly. A portion of the brass washers underneath the Bakelite board may be cut off, if necessary, to prevent these from touching the aluminum battery spacer. Contact between one of the washers and the spacer could result in short-circuiting the batteries.

When installing the batteries, battery polarity must be carefully observed. Incorrect battery insertion would apply improper voltages to the transistors and could result in their destruction. If the case has been properly constructed and the battery spacers correctly installed, the batteries will fit snugly between the spacers. The bottom edges of the batteries will extend slightly below the aluminum case. Because of the spring contacts, however, the batteries may be pushed upward so that the Bakelite bottom plate may be fastened to the lower set of battery spacers. This compresses the springs and assures positive contact between the batteries and the circuit.

A readily obtainable, low-cost leather carrying case houses the completed assembly. This case was originally intended

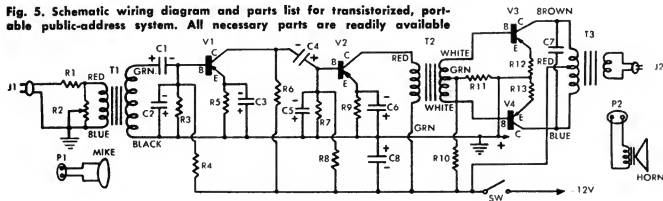
for a commercial multimeter and includes some wood support pieces which must be removed for this application. The PA assembly can then be fastened to the leather case by using the rivet holes through which the wooden supports were originally secured. A long shoulder strap can easily be added.

In use, the lightweight loudspeaker may be hand-held by means of a handle made of 1-in. hollow aluminum stock, or it may be mounted to a post or other fixed installation at a considerable distance from the amplifier. Weatherproof two-conductor cable should be employed between the speaker and amplifier for outdoor use.

When used indoors, a loud howl will be heard through the speaker at advanced volume-control settings. This is due to acoustical feedback and can be eliminated by increasing the distance between the speaker and microphone.

The size and weight of this PA amplifier could be greatly reduced through the use of smaller, lighter batteries. Such a modification would require a different method for holding the batteries in place and connecting them to the circuit. The lantern batteries originally used were selected because they are readily available and will last a year or longer under normal operation. Smaller batteries require more frequent replacement but, due to the efficiency of the amplifier circuit, even such units will provide reliable performance over a relatively long period of time. ★ ★ ★

**Fig. 5. Schematic wiring diagram and parts list for transistorized, portable public-address system. All necessary parts are readily available**



## LIST OF MATERIALS

TRANSISTORS: V1, V2—GE 2N190; V3, V4—GE 2N188A

**CONTROLS:** R2-1 meg pot with switch (SW) audio taper

**RESISTORS:** (All  $\frac{1}{2}$ -watt carbon) R1 - 330,000 ohms; R3 - 10,000 ohms; R4 - 100,000 ohms; R5 - 1000 ohms; R6, R7 - 15,000 ohms; R8 - 82,000 ohms; R9 - 6800 ohms; R10 - 4700 ohms; R11 - 47 ohms; R12, R13 - 10 ohms

**CAPACITORS:** (All 25 volt or greater) C1, C3, C4, C6—15 mfd. sub-miniature electrolytic; C2, C5—.1 mfd. miniature tubular; C7—.01 mfd. miniature tubular; C8—50 mfd. miniature electrolytic

**TRANSFORMERS:** T1—200,000:1000-ohm input, Argonne AR-100; T2—10,000:2000-ohm driver Radio Shack No 9969C; T3—400-ohm C.T.:11-ohm output, Argonne AR-120

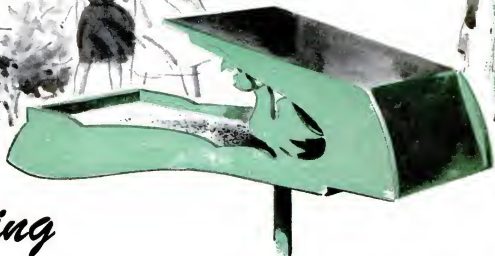
**MISCELLANEOUS:** University model MIT speaker: Astatic M101 ceramic

rc mike; 2 Eveready No. 509 6-volt lantern batteries with spring contacts; carrying case—Simpson 4136 multimeter case with center supports removed and carrying strap added; 2 Bakelite or phenolic boards (5-1 4 x 3-1 16 in and 5-3 8 x 3-1 8 in.); printed-circuit board (see text).

**HARDWARE:** 16-gauge aluminum panel, 6½ x 11½ in. (panel with all holes marked and large holes punched is obtainable from Dorsett Tool Co., Norman, Oklahoma); 5-in. length of inch-square hollow aluminum stock, for horn holder; P2 Cinch-Jones P302 CCF plugs with cobalt steel sockets; P1, P2—Cinch-Jones P.302 CCF plugs with cobalt steel sockets; 1 black pointer knob; assorted screws and nuts (4-40; and 10-32); 4-½-in. brass washers; 4—metal spacers, ¾-in. high, to fit No. 10 screws; 4—10-28 flathead brass screws; 4—4-40 inch nuts; 4 pieces aluminum stock ½ x ½ in. Austin Craft Battery box 2D, cut to size for mike clip.



# The CRAFTSMAN X62



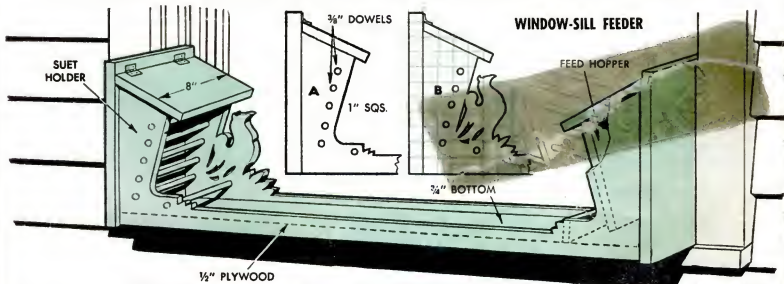
## Attracting SONGBIRDS TO YOUR GARDEN

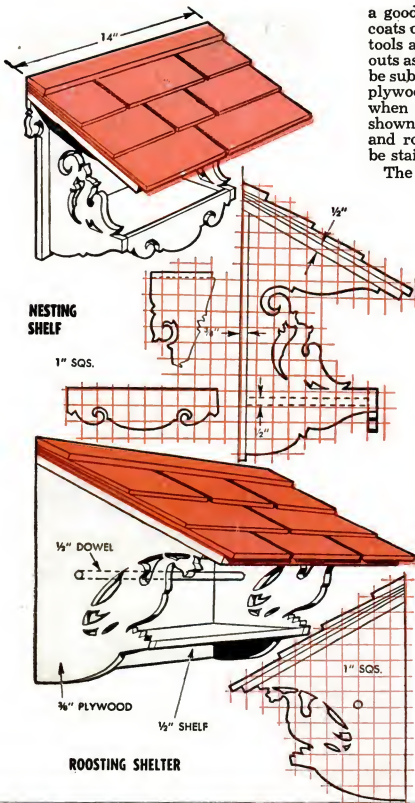
By C. W. Woodson

SONGBIRDS WILL FIND the trees and shrubs in your back yard an ideal place in which to live if feeding stations, bird-houses and shelters, such as the ones illustrated, are made available for their use and enjoyment. Many of the desirable species will spend only the summer months with you, but some of the hardier ones may stay on to become permanent guests. The cost of food and materials required to build and provision these facilities is small compared to the number of benefits derived from the birds. They feed on insects and destructive worms and are a good source of entertainment and interest with their

amusing antics, variety of songs and colorful plumage.

The most practical way of getting started with your back-yard bird haven is to build and install these facilities singly over a period of time starting with a feeding station. Where parts of houses or feeders are cut from plywood, the exterior type should be used to avoid deterioration from the weather. For the decorative parts, first make full-size patterns of them from the squared drawings and then make the cut-outs with a jigsaw. All of the structures are assembled with glue and finishing nails. Exposed surfaces are given two coats of

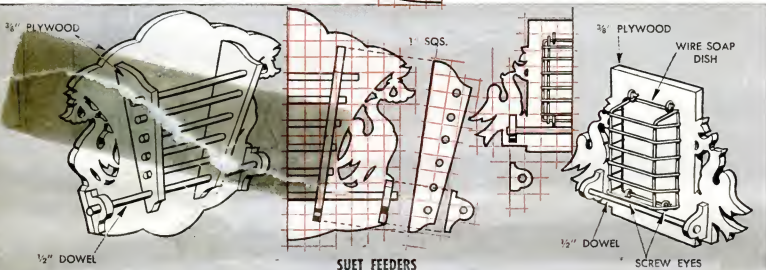




a good grade of exterior paint with three coats on the plywood edges. If the required tools are not available for making the cut-outs as shown, straightedged members may be substituted as necessary. Exterior-grade plywood need not be used for roof boards when they are covered with shingles as shown on the flicker house, nesting shelf and roosting shelter. Cedar shingles may be stained or left unfinished as desired.

The pivoting feeding station, shown at the bottom of page 165, is easy to make and is the best type of feeder for all seasons because its weather-vane design permits the feeder to head into the wind. This helps to keep the food placed in it dry, free of snow in winter, easily accessible to birds and out of reach of cats. After the parts are cut to shape and contacting edges are coated with glue, they are assembled with finishing nails. Then, exposed edges are sanded smooth and given several coats of exterior paint, two coats on the rest of the outside surfaces for complete protection from the weather. For the pivot, a pipe flange is screwed to a crossbar on the underside of the feeder and a short length of pipe turned into it as shown. The short length of pipe is then inserted in the end of a larger steel pipe that is first driven into the ground for a post. Grease should be applied to the pivot periodically to reduce friction and prevent noise that might scare birds away.

For a suet feeder, you can make one of the single-unit types as shown at the bottom of this page, or the multiple purpose window-sill feeder shown at the bottom of the first page of this article. Other than making the decorative cut-outs for the backs of the single-unit feeders, they are very easy to construct as shown. The window

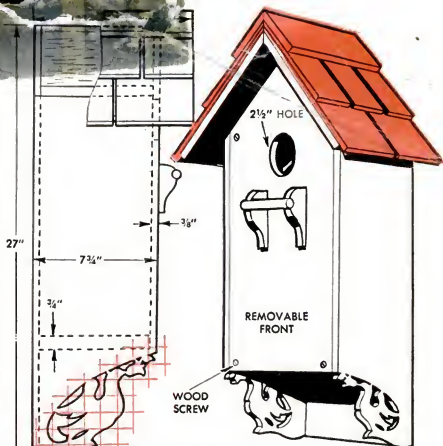


feeder has a hopper for seeds at one end, a suet holder at the other end and a large shelf between for dishes of water and bread crumbs. With this feeder mounted on a window sill you can observe birds at close range from within the house. The length of the feeder is determined by the width of the window sill on which it is placed and is assembled in the same manner as the feeding station.

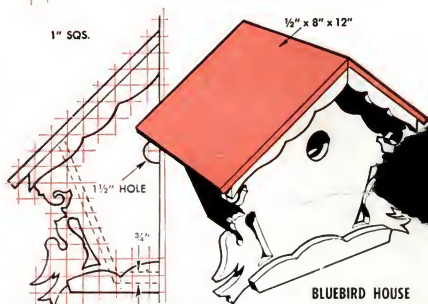
The flicker house and bluebird house are also assembled and finished as described, except that the front panel on the flicker house is screwed in place to allow it to be removed for easy cleaning of the interior. In addition, the inside surface of the front panel is scored with a series of saw cuts from the bottom to the hole to make it easier for fledglings to claw their way to the opening when it is time for them to leave the nest.

Robins, barn swallows and phoebes build their nests in open-type shelters, such as the nesting shelf shown. It is designed to be hung from the eaves of a building and should be placed from 7 to 14 ft. above the ground. If desired, this shelter may be treated with a preservative and allowed to acquire a natural weathered look.

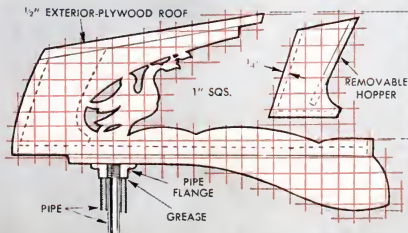
If your back yard lacks trees that are large enough to safely accommodate roosting birds, a roosting shelter can be made as shown, and hung from an eave on the house. The length of this one is 24 in., but this dimension can be increased to 30 or 36 in. depending upon the anticipated popularity of the shelter. Also, some type of bird bath should be provided in addition to the facilities illustrated in this article. ★ ★ ★



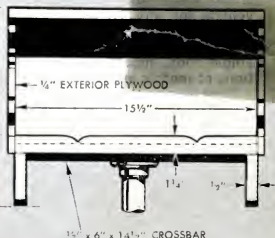
FLICKER HOUSE



BLUEBIRD HOUSE



PIVOTING FEEDING STATION



FRONT VIEW





Versatile is the word for this golf-cart-runabout. Grandmother, Mother, Dad and the kids all find use for it



## GOLF CART—OR FAMILY RUNABOUT

*First, it's a golf cart powerful enough to carry two adults and equipment up steep slopes. But it's also a heart-saver for the aged, "legs" for an invalid, and a "school bus" or shopping "car" for Mom. It features twin-motor drive, four speeds forward and reverse, coil-spring suspension, 2-wheel brakes and tricycle steering, plus a built-in battery charger*

### PART I

By Tom Riley

**S**PEEDS UP TO 20 m.p.h. and 30 to 40 miles on a single charging of the batteries make this cart an ideal utility vehicle for any home, farm or business. The cart is wide and low, both to assure stability on any terrain and to provide ample room for any of several combinations of motors and batteries.

First step in the construction is to make the main frame, Figs. 7 and 10, of steel channels and angles. Arc welding is required in this assembly. The next step after the main frame is assembled is to assemble the drive-unit frame, Figs. 7 through 11. The rear cross member of this frame is a length of  $\frac{3}{4}$ -in. pipe that pivots

in two U-shaped brackets bolted to plates that are welded to the rear cross member of the main frame. The brackets are a loose fit on the pipe. Strips of inner-tube rubber then are wrapped on the pipe under the brackets to provide a "snubbing" pivot. Stub axles for the rear wheels are welded to a length of pipe to produce a complete axle, that will give a width of  $41\frac{1}{2}$  in. between the outer sides of the tires. This leaves a clearance of  $\frac{3}{4}$  in. between the tires and the outer edges of the cart's main frame. The drive-unit frame is made narrow enough to clear the brake drums on the wheels. Coil springs used in the rear suspension are kept aligned by  $\frac{3}{4}$ -in.



pipe caps bolted to spring plates at the front of the drive-unit frame and to the 2-in. cross member of the main frame. A long  $\frac{3}{8}$ -in. bolt with fuller balls at each end is used to "snub" the frames together and to prevent sideway of the drive-unit frame. The lower right-hand detail in Fig. 7 shows the snubber bolt, springs and pivot-bracket setups. A piece of  $\frac{3}{4}$ -in. plywood is bolted to the drive-unit frame to support the motors. Slotted holes in the plywood permit the motors to be moved to allow adjustment of chain tension. Heavy turnbuckles are attached to the frame and to the motors near the shaft ends to "hold" this adjustment.

Wheels, which should be purchased before assembling the drive-unit frame because of the need for measurements, can be of several types. For the rear, the wheels should have 4.80 or 5.50 x 8 turf-type tires, such as used on most golf carts. A less ex-

pensive substitute are wheels from light aircraft, which are available as war surplus. These have tires with a channel tread, and are complete with bearings, hubs, and spindles. Also available are 6-in. brake drums and sprockets drilled to fit the wheels. For the front wheel of the cart a rounded tire is best. A  $1\frac{1}{2}$ -in. balloon aircraft tire or a 16-in. standard industrial tire should be used.

The fork assembly is made as shown in the left-hand detail, Fig. 7. Either turned brass bushings or ball bearings can be used, pressed into a counterbored length of pipe or tubing. The latter then is welded over a hole drilled in the 3-in. frame channel, Figs. 6 and 10.

Three types of d.c. electric motors can be used for the cart. Sprockets and chains from light motorcycles are used with each to deliver a speed of from 350 to 400 r.p.m. to the rear wheels. Aircraft starter motors,

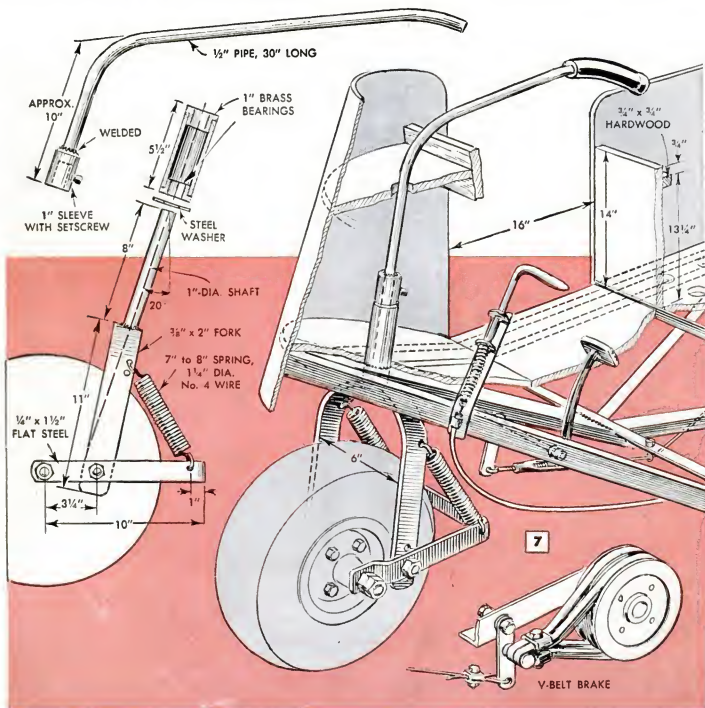
Spend your time improving your game, instead of walking. The cart gets you around in half the time

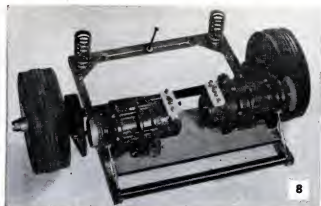




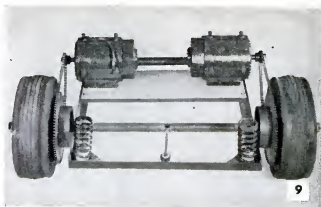
Photo of frame front end shows location of fork, foot and hand brakes, extreme turning angle possible

Fig. 8, available as war surplus, can be used if only moderate power is required. Although rated at 24 volts, they are designed for intermittent service and should be run with four batteries producing 12 volts, or three batteries that will provide 18 volts. Most of these motors turn only about 100 r.p.m., so a large sprocket is fitted on the motor and a smaller one on the wheel. Check the r.p.m. rating of any type motor before obtaining sprockets. A second type aircraft motor, also available as surplus, is a high-speed unit that rotates at about 5000 r.p.m., which makes it necessary to use a gear reducer of from 5-to-1 or 10-to-1 to reduce the speed to a point where chains and sprockets can handle it. A third type motor, the most expensive, is a propulsion or traction motor, Fig. 9, such

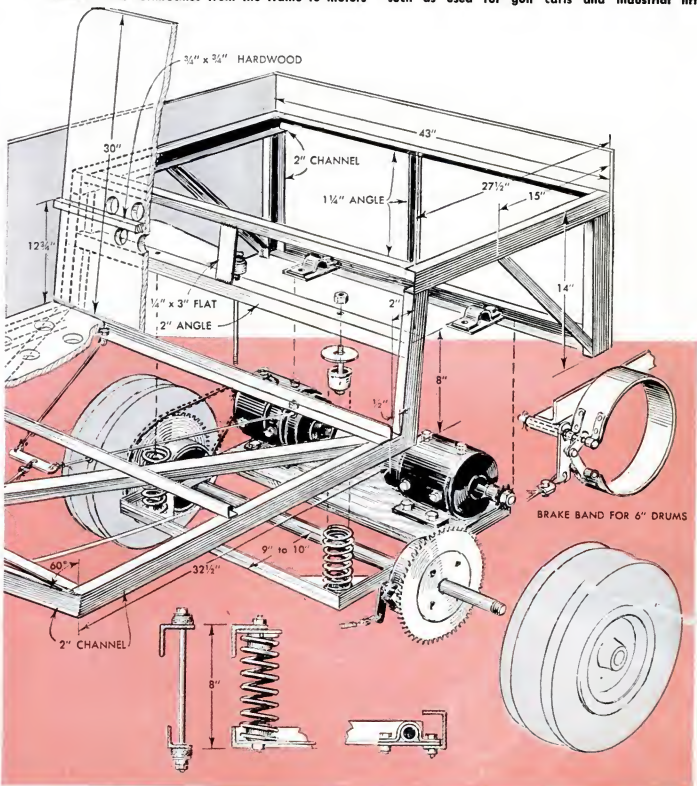




Drive-unit frame with aircraft starter motors installed. Note turnbuckles from the frame to motors



Here drive unit is fitted with propulsion motors, such as used for golf carts and industrial lifts





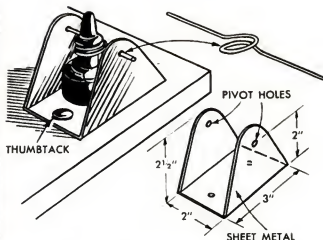




Springs used to counterbalance the hoods of some automobiles are strong enough for the fork assembly

many uses for this versatile golf cart-run-about. If it is to be used by an invalid, the cart should be fitted with hand, rather than foot controls. The "accelerator" pedal can be replaced with a lever-controlled switch on the instrument panel or glove shelf. Brakes also can be operated by a long lever projecting upward through the floor-board and positioned for the driver to grasp it easily. An upward-projecting extension handle also will have to be fitted on the reversing-switch. It is important that this switch be handy for any driver, as it can be used to brake the cart in an emergency. If the cart is to be driven on streets or highways, check with city and state officials for types of licenses required before constructing the cart. You may find that your state or city does not permit a vehicle of this type to be driven on the streets or on the highways. Next month will be shown the installation of wiring, battery hook-up and attachment of the body sides, front and seat.

This view of cart shows neat appearance of seat and rear deck. Note reverse lever at front of the seat



## Bracket Keeps Ink Bottle Level

This ink-bottle holder is intended for use on drafting tables when their entire surface is not utilized for drawing. The base of the holder is a U-shaped piece of sheet metal, drilled to accommodate the ends of a length of stiff wire that is wrapped around the neck of the bottle. Thumbtacks are used to hold bracket on the table.

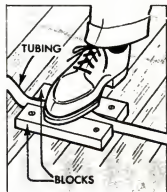
## "Marproofing" Pliers Jaws

When handling chrome-plated metal parts or other materials that must not be marred or scratched when gripped with pliers, fit the jaws with protective leather sleeves, made by cutting the fingers from an old leather glove. This method is quicker than wrapping cloth, leather or rubber strips around the jaws and makes them less bulky.



## Jig for Straightening Tubing

Two wooden blocks cut from 1-in. stock and nailed to the floor provide a simple but efficient means of straightening bent copper tubing. The blocks are spaced the diameter of the tubing, so it can be pulled through between them. Bends that are at right angles to the floor are straightened by pressing down on them with your foot. Work the tubing through slowly, to prevent kinking it.

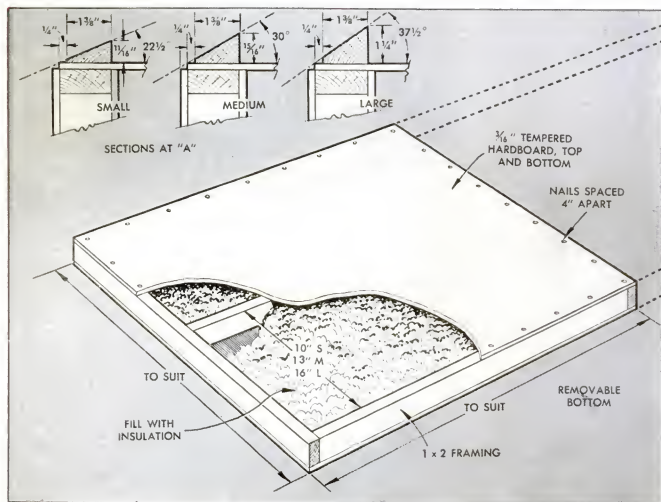


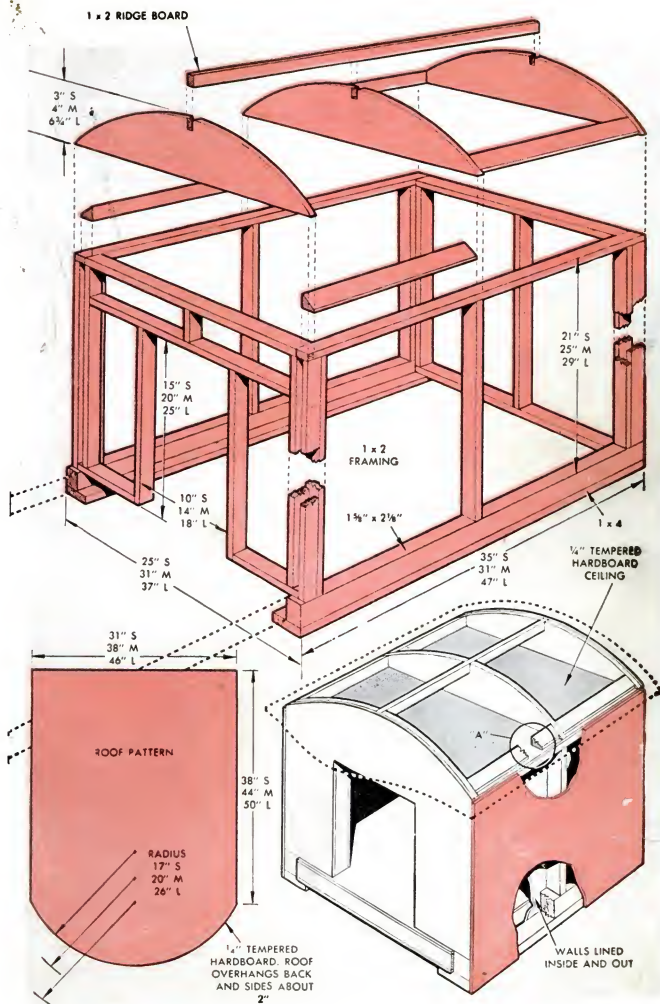


# INSULATED HOME FOR YOUR DOG

WHETHER YOUR DOG IS small, medium or large, this insulated house is designed to accommodate him in year-round comfort. Three figures are given for each dimension, being marked S, M and L, indicating small, medium and large, so that you can build any of three sizes of house to match the size of your dog. The smooth, one-piece roof is cut from a piece of tempered hardboard and is completely waterproof. The floor, which is built as a separate unit and slides out like a drawer

for easy cleaning, is filled with loose insulation. The "attic" formed between the roof and ceiling also has a layer of loose insulation on the upper side of the ceiling. To vent the attic space, drill a number of holes in the front wall, just beneath the projecting canopy formed by the roof. A vent at the rear of the house will require a weatherproof louver. The double walls of the house are insulated by stapling batt-type insulation to the framework before the hardboard covering is nailed in place. Lumber used on the lower edges of the house should be treated with creosote to provide moisture resistance, and the house should be supported above the ground to allow air circulation beneath it. When the house is completed, apply a coat of sealer, and at least two coats of quality, exterior-grade paint. ★ ★ ★





## Aluminum-Foil Lining in Grill Fire Pan Reflects Heat to Grid



Lining the fire pan of a portable charcoal grill with aluminum foil serves to reflect most of the heat produced by the coals to the cooking grid as shown in the photo. Also, the foil tends to provide more uniform distribution of heat for faster and better cooking of hamburgers, steaks and other foods. Heat rays that normally are absorbed by the bottom and sides of the fire pan are reflected back at all angles thus reaching the edges as well as the center of the cooking grid.

## Tinted Calking Compound

When calking joints and cracks on a house with redwood siding or trim, tint the compound with jeweler's rouge or iron-oxide paint pigment to blend it with the natural finish of the redwood. Use of untinted commercial compounds for this work results in an unsightly appearance.

John G. Premo, La Grange, Ill.

## Protect Plants From Cutworms



Here is an easy way of protecting newly planted tomato plants from cutworms that sever the tender stems immediately above the surface of the ground. Simply slit short lengths of garden hose and enclose each stem as shown in the

drawing. The hose lengths are easily removed when the plants begin to mature and no longer are endangered by these worms.

## Plant Rack Clamps on Porch Rail



This easily made flowerpot rack can be clamped on a porch rail of the type shown at almost any location desired. The weight of the potted plants placed in holes cut in the horizontal member holds the rack in place. A skirt is provided on one side of the rack to

conceal the lower portions of the pots. No fasteners are required to secure the rack to the rail, it simply hooks in place.

## Old Farm Milk Cart Serves as Portable Garden Planter



A fresh coat of paint, a pair of cow bells and a length of logging chain have made this retired farm milk cart a handy portable planter. The decorative planter can easily be moved about to add a desired touch of color anywhere in the garden. Also, it does double duty when used for hauling heavy garden material.

## Store Garden Hose in Basket

An ideal receptacle for storing a garden hose is a bushel basket. The wide diameter of the basket will permit the hose to be neatly coiled without kinks or bends for easy handling and compact storing.

M. Robert Beasley, Jackson, Mich.



# HOME TARGET RANGE

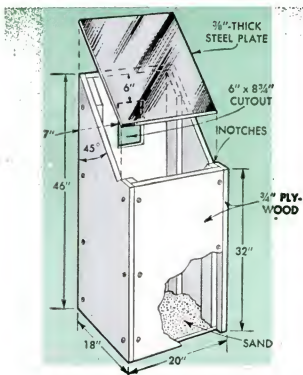
IF INDOOR public or club target ranges are too expensive or inconvenient for frequent rifle target practice, here is a rugged target cabinet that you can make and set up for a range of your own in the basement. Of course, you should first check on local ordinances governing the use of firearms in the home. Also, an unobstructed area about 40 ft. in length and a door leading to the target range that can be locked from the inside for safety are needed.

To make the target cabinet, first cut the sides, front, back and bottom panels from  $\frac{3}{4}$ -in. plywood and screw them to corner

uprights cut from 1 x 3-in. lumber as shown in the drawing. Before the front panel is attached, the target cutout is made in it and heavy-gauge galvanized sheet metal is nailed to all inside surfaces except the front panel. The steel plate for the top that deflects bullets into sand at the bottom of the cabinet can be obtained, cut to size, from a steel supply company. A paper clip screwed to the front panel above the cutout holds the paper targets in place. Illumination is provided by a desk lamp screwed to the front of the cabinet as shown in the photo below.

Ralph Treves, Flushing, N. Y.

Gooseneck desk lamp attached to front of plywood target cabinet provides nonglare illumination for target

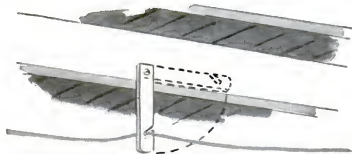


# Solving HOME PROBLEMS



**TWO-VEGETABLE "DOUBLE BOILER,"** left, is drip coffeemaker with strainer removed. One vegetable is cooked in water in lower half, steam rises to cook food in upper half

**CENTER SUPPORT FOR CLOTHESLINE** in basement, below, is notched length of 1 x 2 or other stock, screwed to floor jaist so it pivots up out of way when not used



**PAIR OF EMBROIDERY HOOPS** fitted in top of mesh vegetable bag, above, that is used to store toys, provides hand grip, keeps mouth of bag open so it is easy to toss in articles as they are picked up from floor



**DENTS IN INLAID LINOLEUM,** left, are reduced with aid of 250-watt heat lamp that softens material. Handle of table knife is used to "burnish" edges of dents to make them less noticeable. Avoid overheating with lamp



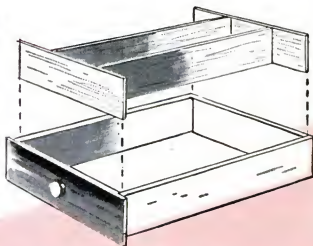
**HANG MISCELLANEOUS KITCHEN ITEMS** on "ready-made rack," above, that consists of unit taken from discarded loose-leaf notebook. Unit is screwed to wall in convenient location, items "locked" in rings



**CABINET FOR CANNED GOODS** is over refrigerator, above, has inclined racks rather than shelves. Cans slide down as lower one is removed. Strip across bottom holds in cans, has identifying labels on it

**"SPRINKLING CAN"** FOR HOUSE PLANTS is another adaptation of versatile, plastic squeeze bottle, below. For a number of plants, larger bottles, such as those in which glue is packaged, should be used

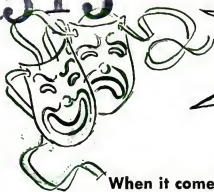
**LIFT-OUT PARTITIONS IN CABINET DRAWERS**, below, simplify the task of cleaning and lining them. In some instances, where partitions are fastened, they can be cut loose and made removable



**PREMIUM STAMPS WON'T STICK TOGETHER** while waiting to be pasted in a book, right, if they are slipped between sheets of wax paper kept handy to store them until you have time to sort them and place in the right book



# X515



# BOZO

## THE PUPPET

PART  
I

When it comes to size, Bozo is a large puppet and if carved from wood, he'd "weigh a ton." Actually, he's a "featherweight," for he is hollow. In this two-part story Dorothy Rankin, professional puppeteer, shows *Popular Mechanics* readers how they can mold large-size but lightweight puppets from a plastic cloth called Celastic



Notice that Bozo's hat is modeled separately in clay and that mouth outline is drawn in clay with nail

Sheet-metal shims pressed in clay at center of face serve as parting line for plaster-of-paris castings

PUPPETEERS have to watch their weight — the weight of their puppets, that is. Holding one at the end of a string for hours at a time will tire the huskiest of troupers. That's why most puppets are small and why most puppet audiences wind up with strained necks. Now, thanks to plastic cloth, large-size puppets are practical since this new modeling material keeps the weight to a minimum. Bozo stands nearly 3 ft. tall and yet he weighs less than 5 lb.

Not only does plastic cloth produce a puppet far lighter than wood, but it simplifies puppet making to the point where almost anyone can qualify. In the process to be described, the puppet is made hollow throughout from a material called Celastic, which is a plastic cloth that comes by the yard. You work with it by cutting it up in small pieces and then dipping it in a special welding solution which makes it very limp and self-conforming. The pieces are applied wet, one at a time like patches, to plaster-

Each side of clay face is cast separately. Enough plaster of paris is added to form 2-in.-thick layer







#### ABOUT THE AUTHOR

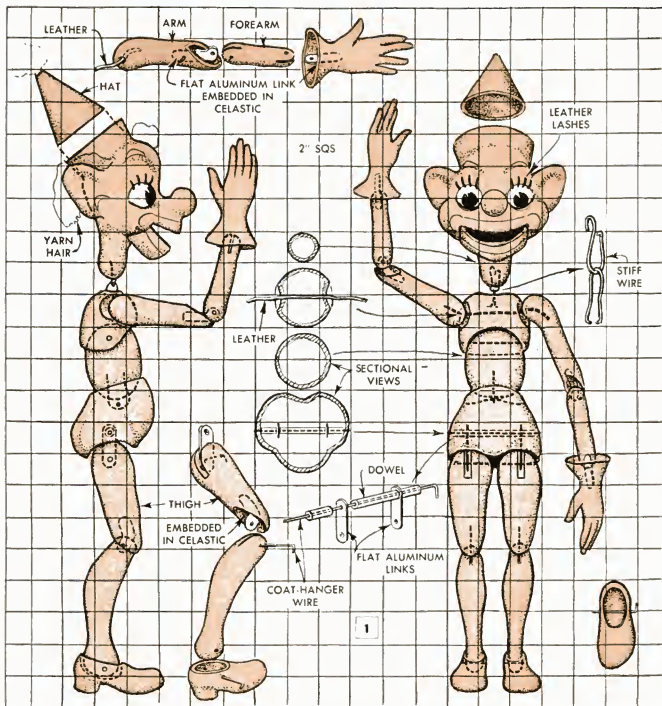
Dorothy Rankin's "Little Theater Marionettes" are well known for their performances all through the New England states where her troupe makes a yearly tour. Through the magic of black light, her shows, which are created especially for adult audiences, express fantasy in a miniature review rather than stories. Puppeteer Rankin has played before TV, and her puppet film on safety won her the coveted Vienna film award. During the summer you'll find Dorothy at the Puppeteers of America festivals where she lectures and demonstrates the art of making her large-size puppets from Celastic

DOROTHY RANKIN  
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Above, a puppet's personality is largely conveyed through his face. Here puppeteer Rankin holds clay model of Bozo's head. Lower left, clown magician, another of Rankin's creations, is loaded with gimmicks. Below, Bozo's lifelike movements come from ball-and-socket joints which make him extra limber





Full-size patterns enlarged from these squared drawings give size and shape of body members for modeling in clay. Sculpturing of head is most important of all since rest of body, except hands and feet, is covered

of-paris molds. When dry, the resulting  $\frac{1}{16}$ -in.-thick shell is extremely strong, smooth and lightweight.

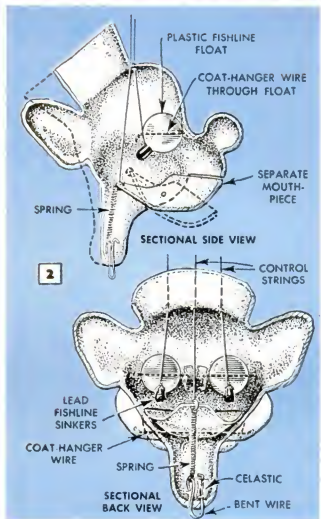
The most painstaking part of copying Bozo, or making a figure of your own, is molding the parts of his body in clay which must be done first so that plaster-of-paris molds can be made from them. While this requires a certain amount of sculpturing ability, you'll find that if front and profile patterns of the various parts are made and used as a guide, you'll be able to model Bozo quite closely without too much difficulty. Such patterns are easily made by ruling off on paper the same number of 2-in. squares as given in Fig. 1 and tracing the outline in corresponding squares. Plas-

tic ball-type fishing floats are pressed in the clay to form eyeball sockets. These same floats serve later as Bozo's eyeballs. Most of your sculpturing efforts should be spent on the head since the rest of Bozo is covered by his suit. Hands and feet, as well as arms and legs, must be modeled right and left-hand. In modeling the face, strive for a balanced contour. The mouth is a part of the clay mass but is outlined in the clay to later serve as a guide in cutting out the mouth in the plastic-cloth shell. Note that the top part of the hat is sculptured and cast separately.

To conserve on clay, sculpture the front, or face, of the head first, leaving a base of clay to support it horizontally. The plaster



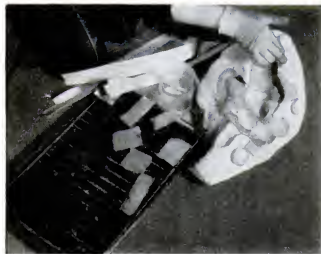
Left, plaster molds of head are cast in three parts. Above, Celastic parting agent is applied to molds to keep the mask sections from adhering to plaster



mold for the head is cast in three sections, two front sections and a back one and in order to register the back one with the others, half-round balls of clay are stuck to the clay base to form registering sockets, or keys, in the plaster molds. Similar balls are stuck to one side of the metal shims to be described. Before the molding plaster is poured over the clay, sheet-metal shims are pressed edgewise into the clay to form a parting line in the casting. The shims are flat pieces of metal about  $1\frac{1}{2}$  in. square and are inserted on a line splitting the nose from the neck to the top of the head. From this point the shims are pressed in the clay along lines just behind the ears. These particular shims will provide a flat surface for the back mold section.

The next step is to pour the plaster. This is done on one section of the face at a time. The molding plaster consists of plaster of paris, two parts, and water, one part which are stirred to a smooth, creamy consistency. Build up a layer about 2 in. thick and work fairly fast, since once the plaster begins to set, it hardens quickly. After about

Lower left, here plaster mold is being lined with layers of Celastic which is applied in patches. Below, the completed shells being lifted from molds







Halves of face mask are joined at center with bits of Celastic



Mouth section is cut out of mask with a sharp knife, new mouth modeled in clay



Here separate mouth section of Celastic is fitted in opening



As done with mouth, eyeball openings are neatly cut in mask



Bozo's eyes are plastic fishline floats counterweighted with fishline sinkers

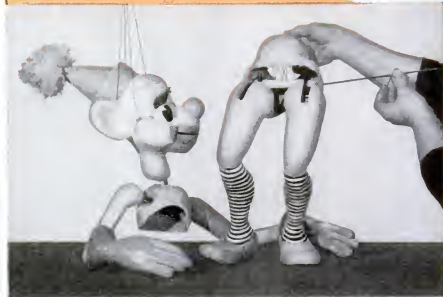
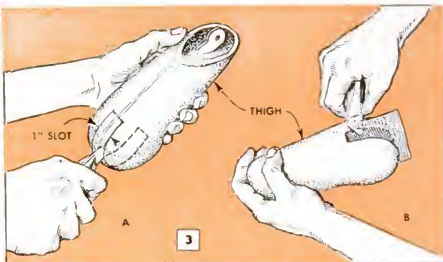


Slits for leather eyelashes are formed with wood-burning tool



Above, Celastic cement is used to glue the eyelashes. Below, thigh members sit astraddle drying jig for filling end cavity





20 min. remove the parting shims and coat the edge of the plaster mold with grease. Then continue to pour the other section of the face. The grease will keep the two from sticking together. Before the rear section can be cast, the back of the head must be completed in clay. When this is done, the parting lines of the two plaster casts just made are greased and the rear section is poured. The last steps in making the plaster casts are to soak them in water for about 1 hr., let drip dry and then quickly brush Celastic parting agent on the inside surfaces. This will keep the plastic cloth from sticking to the molds.

At this point you actually start making your puppet. Take your plastic cloth and tear it into strips about  $1\frac{1}{2}$  in. wide and then cut the strips into pieces 2 or 3 in. long. Now, wearing rubber gloves, dip about a dozen of the pieces in acetone and place them on a rack, such as a baking grill. The acetone will soften the plastic cloth and make it very limp and pliable. Start applying the patches to the mold impressions one at a time, pressing them carefully into all the nooks and crannies of the face. Let them overhang the edges of the plaster

cast a little. Add one layer, then a second and a third in succession. Don't rush the job. Each section of the mold is handled separately, but in the very same manner. It will take about 6 hr. for the plastic cloth to dry thoroughly. When removed from the plaster-of-paris molds, the thin built-up face sections not only will be extremely lightweight but surprisingly strong.

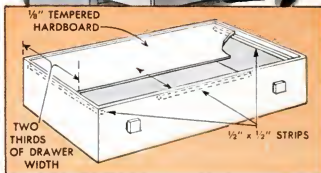
The two face shells are trimmed of excess around the edges and are fused together down the middle by bridging the joint with bits of acetone-soaked plastic cloth. By smoothing with the fingers, the patches will flatten out to paper thinness so that no ridge lines will show on the completed face. Any unevenness in the face contour, such as wrinkles or seams, may be smoothed over with Celastic mastic compound or with wood putty thinned with acetone. Touch up just where needed—the less the better since lightness and thinness are important in making large-size puppets.

Since the clown's mouth is designed to open and close the entire mouth and chin section in the shell is cut away with a sharp knife, following the guide-line impression, and a new jaw is molded of clay. A plaster

cast is made of the new jaw and from it a plastic-cloth shell. The drawings in Fig. 2 show the shape of the separate mouth piece and how it is actuated by a spring attached to a wire in the neck. The jaw pivots on a length of coat-hanger wire which passes through the cheeks. The ends are bent downward and anchored, and smoothed over with bits of plastic cloth. Next, the eyes are cut out of the shell to form sockets for the fishing-float eyeballs. Like the jaw piece, each eyeball is pivoted with a length of wire, the ends of which are bent downward and secured on the inside of the shell with bits of plastic cloth. Pieces of leather shoelace are used for eyelashes and are cemented in holes burned in the eyeballs with a wood-burning tool. Cut the eyelashes about 1 in. long. Now, working from the inside of the shell, hold the eyes in a closed position and burn a hole in each eye near the top and cement a lead fishline sinker in each hole. The sinkers are used to counterweight the eyes and keep them normally open. A second hole is burned in the back of each eye to admit air so the Celastic cement will dry. This is important. The best way to anchor the sinkers is to insert a piece of plastic cloth crosswise through the eye of the sinker before coating with cement and inserting through the hole in the float. You'll notice in Fig. 2 that a wire loop is cemented in the lower end of the neck and left protruding for attaching the head to the body. Fishline, 12-lb.-test, is used for the strings and lengths should be tied at this time to the base of the sinkers and to the end of the movable mouth piece before the back section of the head is cemented to the front. Now go over the entire head and give it a light sanding, then a coat of flat white paint.

Making the limbs and body is done in much the same manner, first in clay, then in plaster and finally in Celastic. Ball-and-socket-type joints give a lifelike action to Bozo and Fig. 3 shows how slots are formed in the upper ends of the thighs to receive flat links which pivot them to the hips. First a slot is cut as in detail A. Then the slot is lined with plastic cloth by placing the thigh astraddle a forming jig. Finally, the excess cloth is trimmed off evenly as in detail B. Any  $\frac{3}{4}$ -in. board will serve as a jig which is covered with aluminum foil to prevent sticking. Two thicknesses of plastic cloth are dipped in acetone and placed over the aluminum-covered board. Then the thigh is pressed down over the jig and left to dry. Similar slots are made in both ends of the forearms and the upper ends of the legs. Here, the slots are made much narrower, about  $\frac{1}{8}$  in. wide, to provide less play in the joints.

(To be continued)

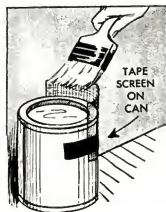


### Drawer Serves as Writing Desk

If you live in cramped quarters where there is not enough space for a small writing desk, a chest drawer can be converted for writing by fitting a piece of tempered hardboard to the top of the drawer. This should be wide enough to cover about two thirds the width of the drawer, and is held in place by cleats screwed to the inside surface of the drawer as indicated. Mount the cleats so that the hardboard is flush with the drawer top. The "desk" may be moved back to get at the contents of the drawer, or it may be removed entirely.

### Loose Bristles Easily Removed From Paintbrush

If loose bristles spoil your paint or varnish job, wipe the brush across the end of a piece of screen wire occasionally to remove them. If the wire is taped to the side of the paint can as indicated, it always will be at hand.

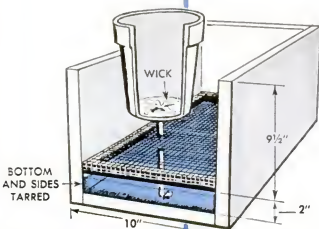


### Sharpen Sewing-Machine Needle

A quick way to sharpen a dull sewing-machine needle without removing it from the machine is to "sew" a sheet of emery cloth. Needle will sharpen itself.



**HANGING PLANTER** is coconut half-shell with bottle cap over drain hole drilled in bottom

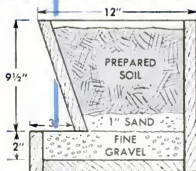


**SELF-WATERING PLANTER** made by nailing hardware cloth to cleats inside box and tarring

bottom. Wick nailed to bottom and inserted in pot carries water to plants by capillary action



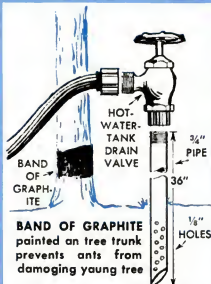
# Gardening



**SUB-IRRIGATED PLANTER** is assembled with marine glue and screws. Inner surfaces are coated with tar to seal the joints



**WATER PISTOL** is handy for spraying insecticide on undersides of plant leaves. Thoroughly rinse inside of pistol with water immediately after using



**TREE-ROOT IRRIGATOR** permits watering of root system for fast growth. It is made of galvanized steel pipe, coupling and hot-water tank drain valve



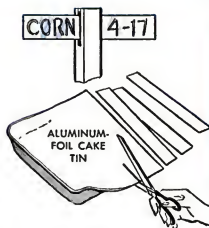
**FLOWERPOT** placed on coffee can for painting, can be rotated without touching pot for fast smudge-free paint job



**PARCEL-SIZE RURAL MAILBOX**  
mounted on post in garden pro-  
vides convenient storage for  
frequently used garden tools



# Hints

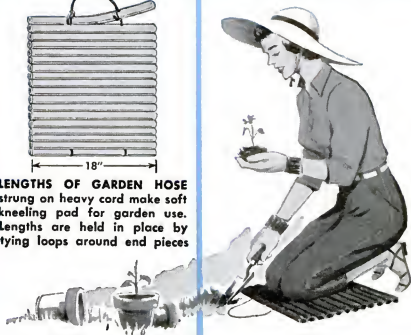


**PERMANENT PLANT MARKERS**  
can be made by cutting strips  
from aluminum pan of type  
used for frozen foods. Plant  
names and dates planted are  
lettered on with ball-point pen

APRIL 1958



**LENGTHS OF GARDEN HOSE**  
strung on heavy cord make soft  
kneeling pad for garden use.  
Lengths are held in place by  
tying loops around end pieces



# "SWISH"

## PART 2



By Glen L. Witt, Naval Architect

**H**AVING COMPLETED the hull framing described in Part I, the next step is to fair (bevel and contour) all members according to the drawings of the transom and frames, and the lines and contours given in the plan, Fig. 24. In fairing, the most difficult part to comprehend is in the forward sections. A wood rasp is handy for fairing the stem and roughing in, but a plane should be used on the relatively flat after sections and final finishing to avoid dips and hollows. The keel should be absolutely straight and parallel to the building form from the transom to frame 3 and be faired to accept the bottom planking at the required angle as in Fig. 30. Also, the chine log should be faired as should each frame, so that each point parallel to the keel and outward from it to the chine is in a perfectly straight line longitudinally from the transom to frame 3.

Proper fairing is of the utmost importance if you want to get the most speed out of your boat. To simplify checking the fairing in the after sections, use a straight-edge. For the curved sections, a length of plywood can be used as in Fig. 13.

**Bottom Battens:** It is much easier to install the battens after all fairing of the hull framework has been completed since the notches for them are made from the faired lines of the frames. Allow the battens to extend forward approximately as shown in

Fig. 22. Forward ends of the battens may be kerfed to permit easy bending of them to the contour of the bottom planking at the bow, Fig. 28. If the battens are kerfed, the inside surfaces of each kerf are coated with glue and the kerfed end secured to the planking by a  $\frac{1}{4}$ -in. brass bolt placed in a hole drilled through the planking and the batten. After the battens are fastened to the frames, fairing should again be checked to be sure the bottom planking will lie flat to all members. Note that limbers (drains that permit bilge water to flow to the lowest part of the boat) are cut in each frame on the outboard side of battens and keel as in Fig. 18.

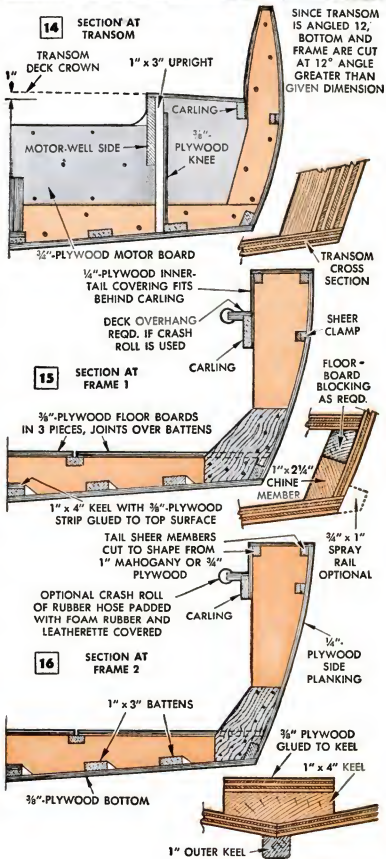
**Side Planking:** Again, the importance of accurate fairing cannot be overstressed. At this time you should recheck all members using the methods described. Each side of the hull is planked with a single length of  $\frac{1}{4}$  x 36-in. plywood 16 ft. long. This should be of marine grade and edge-stamped EXT DFPA A-A. If two panels less than 16 ft. in length are used for a side, they must be butt joined as in Fig. 26. When this is done, the joint should occur between frames preferably in the after part of the hull where the lines are relatively straight.

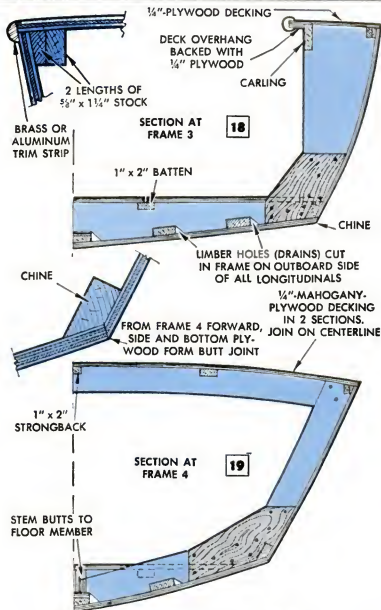
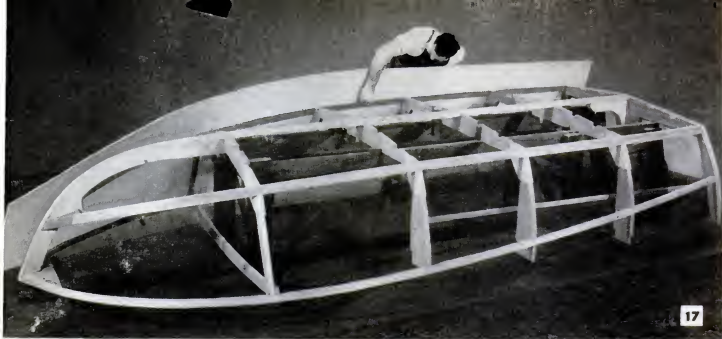
When working alone, the best way to determine the required shape of the planking, is to make a template by stretching wrapping paper around one side of the hull

Fig. 13, thin plywood strip is pressed against each member in curved sections of hull framing that is to receive planking to check on fairing of these members

and marking it accordingly. This is then cut out and traced on the plywood. About  $\frac{1}{2}$ -in. excess should be allowed on all sides to allow for error. Another way of doing this, is to outline the shape of the planking directly on the plywood as in Fig. 17. First the planking is cut slightly oversize and then clamped and temporarily screwed in place at several points for the final fitting. The fitting at the transition joint must be made at the very edge of the chine log as in Figs. 25 and 27. This is the most important joint in the planking. Planking at the sheer, transom, stem and chine aft of frame 4, may be left  $\frac{1}{4}$  in. long for final fitting after it is permanently fastened in place. When the trial fitting meets your satisfaction, the planking is removed and used as a pattern for marking the planking for the opposite side. If the hull is to be coated with glass fiber, a hard-setting glue should be used when applying the planking. If the hull is not to be covered with glass fiber, a soft-setting or mastic-type glue should be used on all underwater joints to prevent leaks. All contacting surfaces are coated with glue and the planking relocated by the trial screw holes and fastened permanently. Screw the planking to the sheer clamp with 1-in. No. 8 screws spaced 4 in. apart. Space them 3 in. apart at the chine and stagger them as much as possible. At the transom and stem, the screws should be spaced 2 in. apart. The planking may be screwed to the frames if desired, but it is not necessary.

The planking for the opposite side is then applied in the same manner. Before doing this, it is advisable to fair the planking on the first side at the stem to obtain a good fit. The planking on both sides is now trimmed even with the chine-log member. Do this carefully and check the fairing as you proceed with a straightedge as before. Again, note the change in type of joint required at the transition joint. From frame 4 forward the side and bottom

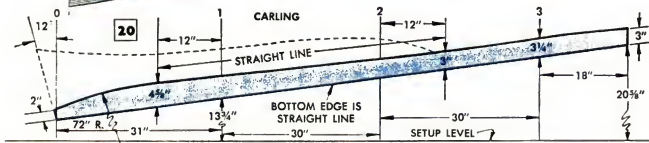




Above, plywood panel for side planking is placed next to framework and chine and sheer lines roughly outlined on it for cutting. Excess is removed later

planking are beveled to form a butt joint. Use the same care in beveling these two members as you did when fairing the side planking from frame 4 aft.

**Bottom Planking:** The bottom planking is cut from  $\frac{3}{8}$ -in. plywood of the same type and grade as the side planking and, like the latter, it is preferred in full-length panels. It is applied in two sections with the joint falling on the centerline of the keel. Fitting the butt joint with the side planking from frame 4 forward is difficult. Do this carefully, first rough marking and cutting it to shape and then trimming the beveled portion until it makes full contact with the opposing bevel on the side planking as in Fig. 23. When springing in the forward end of the bottom section, you will find the material fairly stiff. To make this job easier, cover the area with a few burlap bags and saturate them with boiling water. Also, do the same when fastening the panel permanently in place. When in place, the bow end of the first half of the bottom planking is cut off flush with the bevel on the stem





opposite it as in Fig. 29. The bow end of the second half is trimmed in the same manner, except that it is cut off flush with the outside surface of the first side as shown. Before fastening the first half of the bottom planking, it should be used as a pattern for making the opposite one.

When installing the bottom planking, coat all contacting surfaces as before and fasten each section into position, working from the transom forward. Use 1-in. No. 8 screws spaced 3 in. apart along the chine and keel and 4 in. apart along the battens. The planking may be screwed to the frames but it isn't necessary. A slight overhang from frame 4 aft is planed flush with the side planking, after fastening it, Fig. 27.

**Outer Keel:** The outer keel, or skeg, covers the planking joint at the bottom centerline as shown in Figs. 16 and 24. It may be cut from 1-in. oak or mahogany stock and is set in a bed of mastic and fastened to the planking and keel with 2-in. No. 10 screws spaced 6 in. apart. If the hull is to be covered with glass fiber, the outer keel must be installed over it and bedded in resin of the same type used for applying the glass-fiber cloth.

**Stem Cap:** If the hull is not to be covered with glass fiber, a stem-cap strip of oak stock is recommended for covering the exposed plywood edge at the bow. To provide a surface for fastening the stem cap, a flat area the same width as the cap is cut on the leading edge of the planking as in Fig. 29. This protective cap strip extends from the deck to the forward end of the outer keel and is embedded in mastic and screwed to the stem and keel with 1½-in. No. 8 screws spaced 12 in. apart.

**Spray Rail:** In addition to the stem cap, a spray rail should be provided to cover the joint of the side and bottom planking at each chine as in Fig. 15. If the hull is covered with glass fiber, these members still can be used, but they must be added after the protective material is applied. The spray rail is cut to the size and shape indicated from a single length of oak or mahogany to extend from the stem to the transom parallel with the chine. It is embedded in mastic and screwed to the side planking and chine log with 2-in. No. 10 screws spaced 12 in. apart. In the after portion, from approximately amidships of the hull aft, the spray rail should be trimmed flush with the bottom planking. Up forward, the outer edge may be left at a 90-deg angle for a spray deflector.

**Applying Glass Fiber:** Any hull that is properly covered with glass fiber will last longer, practically eliminate the need for ever refinishing the boat, reduce maintenance costs to a minimum and be much stronger as a result of it. There is nothing



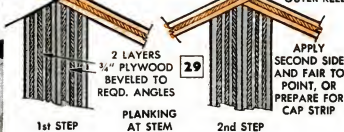
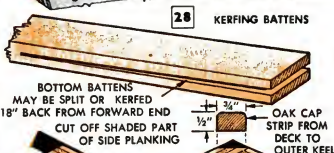
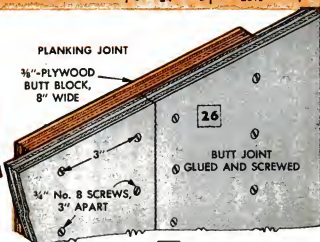
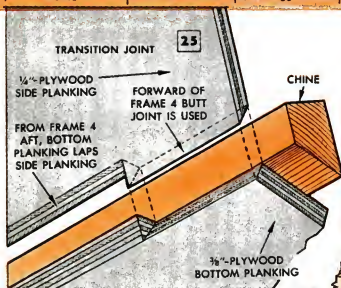
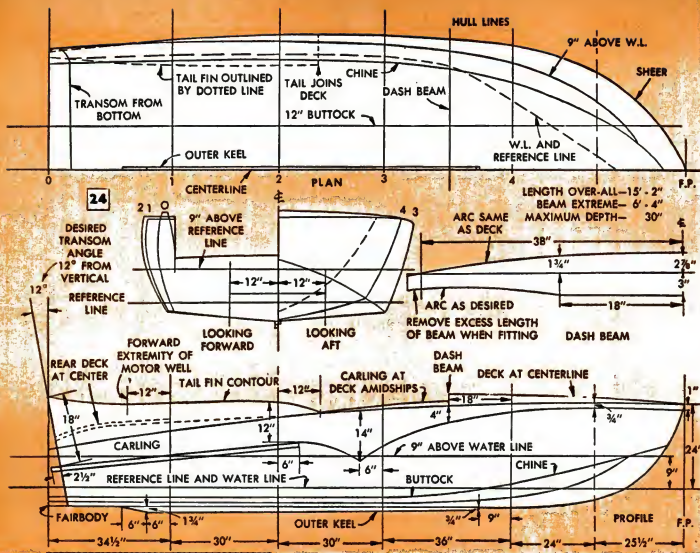
Above, side planking is clamped and screwed into position after it is recut to allow excess of ½ in. on all sides and glue applied to all facing members

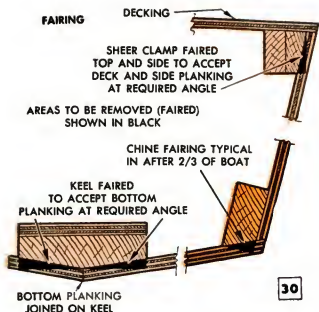


Inboard side of bottom planking is clamped to keel and accurately marked and cut for butt joint on keel. Builder forces planking against stem with knee

Outboard side of bottom planking is allowed to overlap side slightly from frame 4 aft. Forward of frame 4 it is planed to form butt joint with side planking







particularly difficult about applying the material but it is important that the manufacturer's instructions be followed to the letter. Proper proportions in mixing the catalyst with the resin are most important as is the correct temperature for applying and curing it. The usual procedure for applying glass-fiber cloth is to first apply the bonding agent with a brush or roller and then position the cloth on it, carefully removing all wrinkles and bubbles. Finally, a second coat of the resin-catalyst mixture is applied and allowed to harden.

Before painting the glass-fiber covering, sand lightly to remove rough edges, fill holes with wood putty.

**Painting:** Several coats of primer paint are applied to the hull while it is still upside down on the building form. Before doing this be sure all parts of the hull are completely trimmed and screw holes and other cavities or imperfections are filled with a hard-setting type of wood putty and the entire surface sanded smooth. (Do not sand plywood heavily or use coarse sandpaper.) For the undercoat, use a flat resin-type primer, sanding each coat when dry before adding another. It may take several coats to conceal the fir grain in the plywood and build up a smooth surface. Finish coats of paint should be applied after all construction on the boat is completed.

(To be continued)

### Blueprints Available

Those who prefer to build *Swish* from plans larger than the ones presented in the magazine may purchase a set of blueprints, 21x28 in., by writing Blueprint Department, *Popular Mechanics Magazine*, 200 E. Ontario Street, Chicago 11.

### To Save Both Time and Work

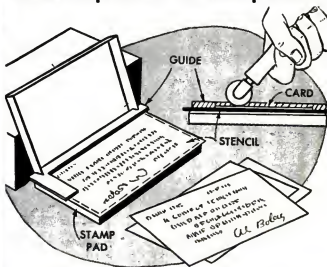
If you wish, you can buy the patterns for the stem, frames, transom, breasthook and chine blocking already drawn full size. And, to further simplify construction, you can buy these parts in kit form accurately cut in mahogany from Glen-L Marine Designs, 9152 E. Rosecrans, Bellflower, Calif.

## Sponge Keeps Print Paper Flat



Unexposed photographic print paper that is stored in the cardboard box in which it is purchased will remain flat for easy handling, if a damp sponge is kept in the box on top of the paper. To prevent drops of moisture from coming into direct contact with the paper, the sponge is placed on a sheet of aluminum foil that is formed around it to expose only the top of the sponge as shown in the photo. Be sure to keep the box closed at all times and re-moisten the sponge when necessary.

## Cards Duplicated on Stamp Pad



With a stamp pad, small hand roller, stencil and L-shaped guide cut from heavy cardboard, you can "Mimeograph" meeting announcements or other information on post cards quickly and easily as shown. Uniform borders on all sides of the mimeographed message are assured for all cards once the stencil is centered under the guide. The latter has slits cut in the outside edge of its longest leg to accept the ends of the stamp-pad lid for proper positioning of the guide on the pad.



WTM 59

X75



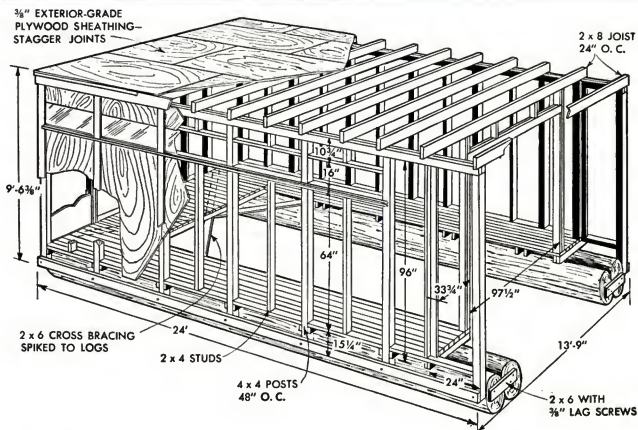
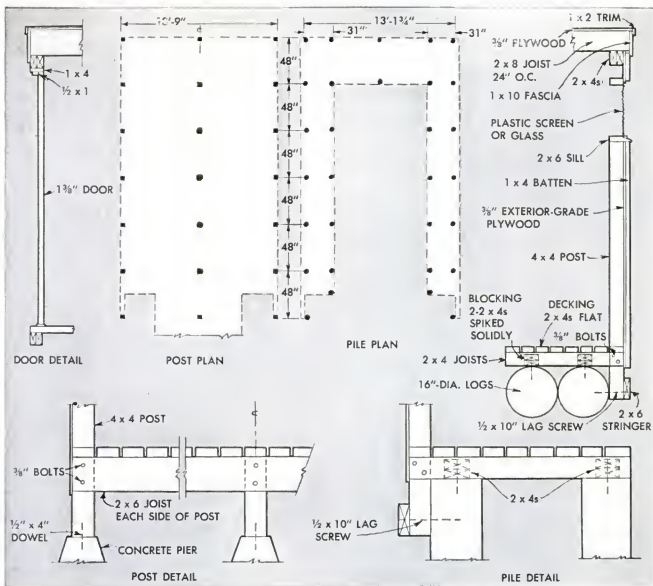
## Build a Plywood-Sheathed Boathouse

**P**ROTECT YOUR BOAT from weather, theft and vandalism by keeping it in this boathouse that is designed to be built by the home craftsman. Great strength and ease of construction are assured by the use of sheets of  $\frac{3}{8}$ -in., exterior-grade, fir plywood. The building may be floated on logs, steel drums or plywood pontoons. Logs are used on the plan shown, but only slight modifications are required to use other means of flotation. If you prefer to have your boat out of the water, the boathouse can be set on posts that are anchored in concrete piers. In the latter case, a 2 x 6 floor joist is spiked or bolted to each side of the posts, the width of the building. Decking, run lengthwise the full width of the boat house, consists of 2 x 4s nailed flat to the joists. The winch used to pull the boat out of the water should be suitably braced. An extra post might be required for some winch installations. Dimensions of a ramp to the water will depend on the boat size, height of the boathouse and other in-

dividual factors. Also, whether the boathouse is built to float, or placed on posts, a short ramp is required leading from the door at the rear of the building down to the beach. A ramp is preferred to a stairway, because motors and other gear can be carried or dragged up a ramp more easily. The door at the rear is an exterior-type door and can be purchased at most lumberyards. Battens used to cover the joints in the walls are either 1 x 4 stock, or 4-in. strips cut from sheets of 1-in. exterior-grade plywood. Sheathing for the open end of the building is formed of two L-shaped pieces cut from plywood. The L-shapes help strengthen the building, preventing it from being twisted or racked by wind and waves. A garage overhead door can be used at the boat entrance, or a drop curtain of canvas may be used, to be rolled up out of the way when entering or leaving with a boat. The roof of the boathouse is covered with roll roofing, all joints heavily tarred. ★ ★ ★

POPULAR MECHANICS





## Temporary Fences Held Against Stakes by Staples and Wire

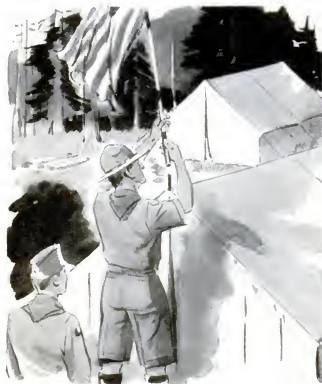


Temporary wire-mesh fences, such as are used to keep pets out of flower gardens, can be set up quickly if the method shown is used. Pointed wooden stakes of a suitable length each have three or four staples driven into one side in a line. After driving the stakes in place and holding the wire mesh alongside so the staples project through the mesh, a length of heavy wire, doubled as shown, is slipped through the staples. The wire should be long enough to permit pushing the ends into the ground. This eliminates exposed wire ends.



### Portable Sunshade for Dog

This portable sunshade-shelter for a dog consists of a piece of  $\frac{1}{4}$ -in. plywood nailed to a frame assembled from scrap lengths of 1 and 2-in. stock. It can be moved easily, being lightweight, so the dog can be kept in the shade, and to prevent the animal from damaging a small area of a yard. Because the lawn or earth provides a floor, there is no cleaning problem, as there is with a doghouse. The open construction of the shelter assures adequate ventilation even on the hottest days.



### Fitting Flag on Tent Pole

Boy scouts and other campers who wish to display a flag on their tent will find that fitting a short length of copper tubing over the end of the flagstaff will permit it to be slipped over the projecting spike of the tent pole. It can be removed easily when the tent is taken down. If the staff of the flag is too large to accept the tubing, tape the latter to the side of the staff for the same result.

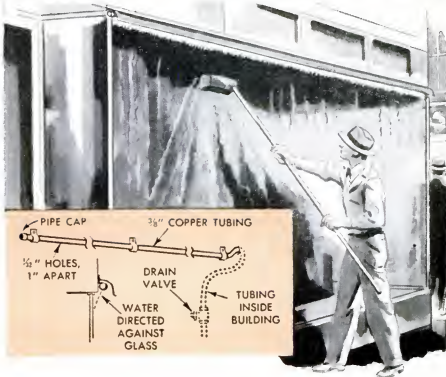
### Repairing Cracks in Plaster

Cracks in plaster, caused by the settling of a new house, should not be repaired until settling is complete. Mark the ends of cracks with a pencil, re-marking them each time they lengthen. When the cracks no longer increase in length beyond the pencil marks, widen them slightly, then fill with spackling compound. Allow it to set thoroughly, then paint or paper.

Sam Fenn, Skokie, Ill.

## Washing of Store Windows Simplified by Perforated Tubing

For store windows that are washed daily, much time and labor can be saved by installing a perforated copper tubing along the top outside edge of the window. The tubing passes through the wall above the window and down to a drain-type valve. When the valve is opened, tiny streams of water are directed on the glass at a 45-deg. angle through  $\frac{1}{32}$ -in. holes spaced 1 in. apart. Removal of dirt and grime is aided by using a brush or rubber wiper while the water is flowing. It is necessary only occasionally to use glass-cleaning detergent.

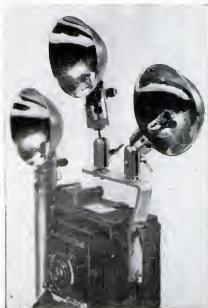


## Bracket Holds Extra Lights for Shadow-Free Photographs

When a single flash gun is located at the side of a camera, it causes harsh shadows to appear beside any subject photographed. One photographer who had this problem with his press-type camera eliminated it by attaching a bracket to the camera that permitted using two additional lights to assure a complete fill-in of light above and on both sides of any subject. The extra lights are fitted with swivel clamps so they can be adjusted to face in any direction. This setup is especially good for taking color shots where lighting is more critical than for black-and-white. The swiveling clamps also permit "bounce light" effects by aiming the auxiliary lights at the ceil-

ing or an adjacent wall. The bracket consists of a length of  $\frac{1}{4}$  x 1-in. aluminum bar, bent as indicated, to pass through the eye and over the clamp of the camera carrying strap. It does not prevent carrying the camera in the usual manner. A hole drilled near the lower end of the bracket is located so that a  $\frac{1}{4}$ -20 thumbscrew can be used to attach the bracket in place of the tripod. Permanent camera mounts on which the lights are clamped—right-hand photo—can be purchased at most photo-supply stores. They are fastened to the upper arm of the bracket with 8-32 screws in holes through the arm.

Frank Fritz, Bensenville, Ill.





### Garden Hose on Wire Fence Eliminates Need for Gate

To prevent youngsters from tearing their clothes or injuring themselves when passing through a barbed-wire fence on the way to a favorite playground, one farmer fitted spirally cut lengths of garden hose over the lower strands of wire. This eliminated the need for a special gate.

### Locking Worn Nut on Bolt



To lock a nut securely on a bolt, even when one or the other is badly worn, slot the bolt end after the nut has been tightened firmly. Spread the slotted bolt slightly with a chisel as indicated. The advantage of this method of locking a nut on a bolt is that simply squeezing the bolt halves together again will permit removing the nut without filing or cutting.

### Panels "Jointed" With Saw

Instead of planing the edges of plywood panels before butting them, try squaring the edges in the following manner. Lay the panels edge to edge on a flat surface, and temporarily tack or clamp them in position. Then run a power handsaw through the joint, and you will have a better job than if you had taken the time to plane them.

M. Robert Beasley, Jackson, Mich.



### Flameless Charcoal Igniter Made From Range Element

Consisting of a heating element from an electric range fitted with a tubing handle, this device permits igniting the charcoal in a barbecue pit without fuel or flame. The element simply is buried in the charcoal for immediate ignition. An insulated cord runs through the tubing handle.

### Camera Tripod Hung on Eyebolt



A camera tripod can be stored out of the way suspended from a hook in the dark-room when a 1/4-in. eyebolt and two nuts are used. The lower of the two nuts is backed off halfway to form a socket and then the second nut is turned down against it to lock it in place. The tripod screw is turned into the threads of the lower nut.

Walter Gottlieb, New York City.

### Steel Wool Reinforces Cement

An efficient way to keep furnace cement from crumbling after it hardens is to reinforce it with coarse steel wool. First form the wool in the approximate size and shape of the crack, and thoroughly work the cement into it. Then press the combination cement-steel wool into the crack with a putty knife or screwdriver, and seal with a small amount of cement. Use your finger to smooth the joint.



# On the MARKET

for Do-It-Yourselfers

**1. PLASTIC FORMS** for casting building stone simulating the naturalness and rugged strength of the finest quarried pieces is now available to the building trades and do-it-yourselfers. Each form will produce six pieces, or panels, in these sizes: Two  $1\frac{1}{2} \times 15\frac{1}{2} \times \frac{1}{2}$  in., two  $2\frac{1}{2} \times 15\frac{1}{2} \times \frac{1}{2}$ , one  $3\frac{1}{2} \times 15\frac{1}{2} \times \frac{1}{2}$  and one  $5\frac{1}{2} \times 15\frac{1}{2} \times \frac{1}{2}$  in. The six panels will cover  $2\frac{1}{2}$  sq. ft. Stone can be cast in various colors

Forms, Inc., 3410 W. Irving Park Rd., Chicago 18

554 W. ADAMS  
CHICAGO

**2. FLEXIBLE DOORSTOP** screws to baseboard, provides a rigid stop for door, yet bends sidewise or downward at a light touch. Prevents foot or ankle injury, does not interfere with cleaning operations. Rubber bumper will not dent or scratch finish on door. Flanged hex section has wood-screw thread which is turned into small hole drilled in baseboard. Each stop is brass plated and lacquer finished

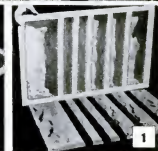
Sherwood Sales Co., 4710 Crenshaw Blvd., Los Angeles 43, Calif.

**3. WATERPROOF COMPOUND** comes in a collapsible tube with a specially designed nozzle for applying the sealer around bathtubs, lavatories, kitchen sinks and for pointing damaged or open joints in plastic or metal tiles. Material flows smoothly under light pressure from tube, making it easy to apply a uniform fillet in a corner where sink or tub joins the wall. Also used for filling cracks, nail holes

Dicks-Armstrong-Pontius, Inc., Dayton, Ohio

**4. ROLL-ON ADHESIVE**, or cement, for installing asphalt and plastic tile on floors, is applied with a long-handled paint roller from a comfortable standing position. Can be used over any floor, hardwood or concrete and over any underlayment. Rolls on in a smooth, uniform coating

Milmark Laboratories, Div. of Mastic Tile Corp., of America, Newburgh, N. Y.





# Buying a Used Camera

By Paul O. Schmidt

**I**F YOU HAVE GRADUATED from the box camera and are considering joining the more advanced group of "shutterbugs," you can find exceptional values in the used-camera market. There's no need to get a dud or be disappointed in the performance of the camera, if the following simple precautions are taken: First, and most important, decide upon the type of camera most suitable for your needs and capabilities. Anyone can take reasonably good snapshots for the family album with an ordinary box camera, a roll of film and a little enthusiasm for photography. However, for negatives that must be exposed under varying light and weather conditions and then enlarged, a camera is needed that has a fast lens, a good range of shutter speeds and accurately synchronized flash. Secondly, study buyers' guides, photo magazines and catalogues to learn what is available in the type of camera you want. Make special note of important characteristics featured in each camera, such as lens speed, shutter speeds, automatically actuated components, coupled range finder, etc. Also, check accessories included and

price of each camera, information you will need to know later when comparing prices of new cameras with used ones. Finally, unless you are buying a camera from a reputable dealer, someone should accompany you who has sufficient knowledge of camera mechanics to spot common defects and can judge its value. If such a person cannot be present to advise you, it's best to take the word of a reputable dealer.

When deciding upon the type of camera to purchase, it is important to consider the type and size of pictures you want. There is no camera that is suitable for all purposes, regardless of price. For example, you may want a camera that takes a film size that is suitable for making big enlargements without grain effect. Or, you may want one that will enable you to take single shots on sheet film instead of using an entire roll of film before developing it; one that is especially suited for taking color transparencies of economical size, or one that will produce a finished picture seconds after it is snapped. Also, you may want a camera with synchronized flash for night pictures or fill-in lighting.

### Popular Types of Cameras

The basic types of cameras beyond the box type are: (1) folding cameras, (2) 35-mm. miniatures, (3) reflex cameras, (4) press and view cameras, which really are modified folding and box cameras respectively, and (5) specialized cameras. Cameras in each of these groups are further divided into three price ranges—low cost, intermediate and premium, the latter including cameras having the most refinements. Most cameras use roll film. Many of them have mechanisms that control shutter cocking to prevent double exposures, have delayed shutter action and exposure counters. Some have coupled range finders that focus the cameras as the range finders are focused. A few of the 35-mm. "automatics" have a single control that releases the shutter, advances the film, counts the exposure and cocks the shutter for the next shot, permitting pictures to be taken in rapid sequence.

The bellows of folding-type cameras make them more compact than the box camera for convenient carrying. Inexpensive models are as simple to operate and as limited in picture-making potential as the box camera. More expensive ones have lenses, shutters and accessories which greatly increase their picture-taking ability. This type also takes album-sized negatives, an important advantage over 35-mm. miniatures.

Miniature cameras also are compact and use economical 35-mm. film. Usually they feature fast lenses and rapid shooting. A very wide variety of lenses, shutter-speed ranges and accessory combinations are available with this type of camera. They make sharp black-and-white negatives or the popular color transparencies approximately  $1 \times 1\frac{1}{2}$ -in. size. These cameras are not difficult to master but require precision use because the small picture size makes projection or enlargement imperative.

Perhaps you desire a reflex-type camera having a horizontal, waist-level ground-glass viewer the same size as the negative. Some models of this type are now equipped with prismatic viewers for easier, eye-level viewing and focusing. Most reflex cameras are available in negative sizes of 35-mm. or  $2\frac{1}{4} \times 2\frac{1}{4}$  in. There are single and twin-lens subtypes. The first has one lens for viewing and exposing, which avoids parallax—the difference in fields of view when separate taking and viewing lenses are employed. A single-lens reflex often is preferred for exacting close-up work, particularly when using interchangeable or auxiliary lenses. If you anticipate a need for multiple lenses, be sure the desired lenses are available for the camera. A twin-lens reflex camera has matched lenses



Above, condition of focusing mechanism of twin-lens reflex camera is determined by noting amount of play found in members of movable lensboard

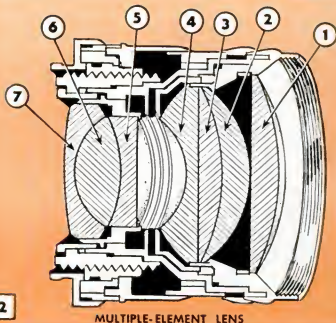
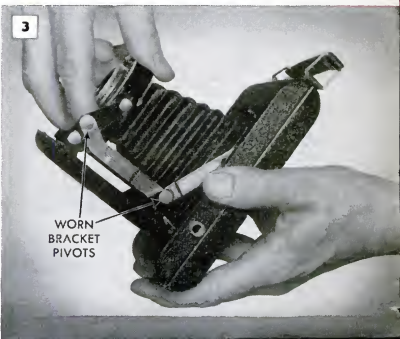
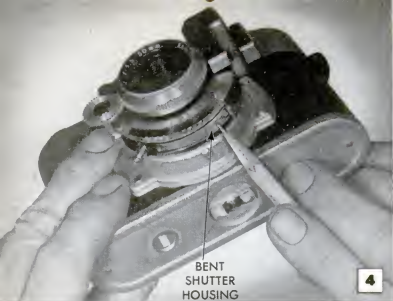


Fig. 2, expensive lens is composed of several optical elements, some of which are cemented together to form cells as elements 2-3-4 and 5-6-7 of lens shown

Below, worn bracket pivots or bent brackets that hold lensboard in required position may cause lens misalignment and make accurate focusing impossible







Above, this camera has been dropped on hard surface, resulting in severe damage to shutter housing and attached mechanisms making the shutter inoperative



Fig. 5, lens-focus mechanism of reflex camera (also, cameras with coupled range finders) should operate smoothly without excessive play or gritty feeling

Fig. 6, chipped edges on sides of plastic reflex-camera body, or warped or bent back may result in improper closing of camera to cause light leaks



that move in unison when focusing. Some have automatic parallax correction but most do not. The amount of correction for the latter must be estimated or calculated by the photographer.

Press-type cameras, which are larger and heavier than most others, are highly versatile and use sheet film, although adapters for roll-film use are available. The 4 x 5-in. negative size is the most popular because it permits making large size fine-grain enlargements without loss of detail or sharpness. The field of view can be seen in miniature through an eye-level view finder, or negative size on a ground glass at the back. Many have adjustable lensboards to control perspective, and some have double extension bellows for extreme close-up work. Because of its bulk and relatively expensive film and print costs, the press camera is suitable only for serious amateurs and professionals.

In the specialized class are subminiature cameras that are easily concealed in the photographer's hand or clothing when taking pictures. The tiny negatives can be enlarged to album-size prints but a high degree of skill is required to produce acceptable prints. This is a limited-use camera. "One minute" cameras have many specific applications where immediate prints are desired. Duplicate prints and enlargements can be made by copying the original. Stereoscopic cameras are equipped with two taking lenses that simultaneously take two pictures of the same subject from which color transparencies are made and mounted in pairs on a slide for viewing. When viewed together, the two nearly identical pictures present a lifelike third-dimensional effect.

An experienced camera enthusiast may find a used-camera bargain in an unknown second-hand store or elsewhere, but the average camera buyer's greatest assurance of good value lies in buying from a reliable dealer. Remember that when he takes a camera in trade for resale, the dealer protects himself by fully evaluating its condition. If needed, the camera is cleaned and reconditioned in his shop or by a reliable repairman. Further, a dealer usually gives some type of guarantee. This may be in the form of money refunded, exchange privilege, or repair or replacement. A dealer cannot be expected to give an unconditional free-trial period since careless customers may damage cameras.

#### External Inspection of Camera

When checking the condition of a camera, first inspect the outside, then the inside. Finally, load the camera with film and make a few exacting tests of its performance for each photographic situation.





**7**  
Loose-fitting camera back should be checked for light leaks that may be caused by missing or tightly compacted yarn packing in grooves in camera body

Honest wear on the outside may detract from a camera's appearance but does not impair its picture-taking qualities. However, look for obvious signs of abuse, such as deep scratches, gouges, cracks, bent or dented parts resulting from careless handling, Fig. 4. If rust is found on exposed metal parts, the camera may have been stored in a damp place and may have rust-damaged parts inside also.

Lenses help make a picture look the same to your film as it does to your eye. They differ in quality, in the amount of light they can transmit and in the size of picture image they focus on the film. Speed, or light-passing ability is rated in f-numbers. The lower a lens' f-number, the greater its light-passing ability. Lenses with considerable light-passing ability have diaphragms over them (usually between lens cells) for use at less-than-maximum opening when desired. Most box-camera lenses are of the fixed-focus type, in one piece and are usually rated at f:11. More powerful complex lenses rated at f:4.5 to f:1.1 consist of many elements of glass, Fig. 2. This is one reason why cameras in which they are used are more costly than box cameras.

If a lens is coated, generally blue but sometimes amber, see if it is intact. If not, it can be recoated at little cost. However, a yellowing appearance in a lens other than a coating likely is the result of disintegrating balsam cement used to hold the elements together. This does not affect the lens quality at first, but as the condition advances it will reduce picture quality. Such a lens can be recemented at considerable cost.

A few tiny scratches on a lens or small bubbles inside do not affect its optical quality, but large ones do. It is important to note that cheaper cameras equipped with high-speed lenses may produce bad picture definition and lack brilliance at



**8**  
Pressure plate that holds film against retaining frame surrounding exposure area should be smooth and exert uniformly light pressure against film

full or near-full diaphragm opening. Thus, the lens may not be usable for photographic situations requiring such lens openings due to defective optical elements or inferior workmanship in assembly. Also, it is essential that a fast lens be fitted to the camera body with more exactness than a slower one.

A lens on its mount or lensboard, when set in its normal position (some are adjustable for height and tilt), should be parallel to the film plane, Fig. 1. Check on the focusing track or tracks on most bellows-type cameras to see that they are tightly attached to the bed and at right angles to the back. On folding cameras usually the lens mount is held by pivoted arms, Fig. 3. If these are bent they may interfere with smoothness of focusing, with opening and closing the camera and may hold the lens out of alignment.

If a camera has a focusing knob, turn it to move the lens completely forward, then backward to check for ease and smoothness of focusing. A bent shutter housing, Fig. 4, or defective gear linkage can cause binding and uneven movement. On cameras that are focused by rotating the lens on a spiral thread, the action should be smooth, without binding or gritty feeling.

On a folding camera examine the bellows to note its general condition. If brittle or patched, chances are that it leaks light or soon will. Also, check the back of the camera for proper opening, closing and locking. A bent or sprung back can cause light leaks, Fig. 6. Also, light leaks may be caused by compacted or worn yarn packing in the grooves in the camera body that receive the cover, Fig. 7.

### General Inside Check

The entire inside surfaces of the camera body should be flat black. Bare or shiny spots on wood or metal may reflect light and ruin good pictures. Such spots can be



Above, film-wind knob should move forward only without binding or excessive play. Parts that come in contact with film must be smooth and free of rust

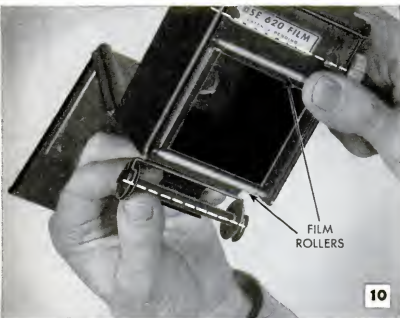
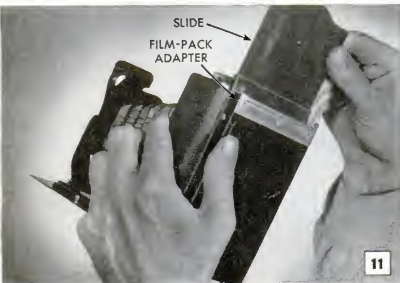


Fig. 10, film spools must be held parallel to each other in camera and film rollers turn freely to permit smooth operation of control for film advance

Fig. 11, film pack must fit snugly in adapter on camera and accept and permit withdrawal of slide without entry of light that would damage film



touched up with a coat of flat-black paint.

On roll-film cameras, the parts on which the film slides must be absolutely smooth and rustfree to prevent scratching the film. The pressure plate that holds the film against the retaining frame also should be smooth and exert uniform but rather light pressure, Fig. 8. The film-advance knob should turn forward only without binding and without excessive play. The film should move easily without strain. This you can check by loading the camera with an exposed film. The spools should be parallel so that the film will move straight and under uniform tension on both edges. Otherwise it will go on the takeup spool unevenly or loosely, permitting it to become light-struck when the roll is removed from the camera.

Cameras on which the film transport also controls the shutter cocking, the mechanism for prevention of double exposures, exposure counting, etc., should be checked with a test film to be sure all the features work properly. On cameras using sheet film, the film holder or film pack should slide in and out freely, yet clamp snugly into position. With the camera back open, inspect the surface of the lens element facing you. Then, open the shutter and lens diaphragm and look for deep scratches and bubble clusters. Next, close the diaphragm slowly while looking through it. The opening should remain nearly circular at all openings which indicates that the diaphragm leaves are working properly. If the aperture assumes an irregular outline at any opening, the leaves may be loose on their pivots.

When checking a bellows for light leaks, look inside while holding a lighted electric lamp next to it as in Fig. 12. Close and extend the bellows during this test.

Erratic shutter speed is a common fault of many old or dirty cameras. The shutter blades may be worn, bent, scratched or dirty, any one of which may interfere with its smooth action. Oil causes shutter blades to stick and collect dust. It should never be applied. To detect shutter inaccuracy for obvious faults, operate it a dozen times or more at each speed marked on the camera, carefully observing its speed by ear and visually. Not the slightest trace of light should be seen through the shutter when it is closed.

A flash attachment can be tested for continuity of wiring as follows: Place a flash-light bulb of proper voltage in an adapter that fits the flash socket. Then, momentarily short the two contacts in the attachment plug, which should cause the bulb to light. Precision checking of flash synchronization is a job for an expert camera repairman who has equipment to check the



**12** Electric light is held close to camera to locate light leaks that are most likely to develop at sharp bends and points of attachment of bellows



**13** When range finder is coupled to lens, distance from camera to subject focused upon should be same as that which is indicated on focusing scale

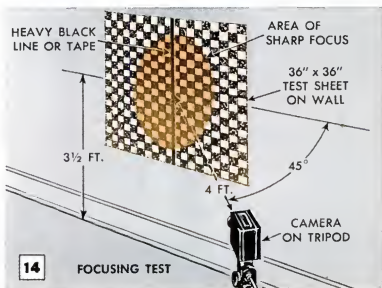
millisecond delay. About the only way you can discover error in timing is to shoot a roll of film and observe whether flash pictures taken at recommended settings are properly exposed.

To check a coupled range finder, simply mount the camera on a tripod and set the aperture at its maximum opening. Then, remove the back of the camera and tape a square of ground glass or wax paper over the film plane, the area normally occupied by film when exposed. An image produced on the film plane should have maximum sharpness when the lens setting on the focusing scale corresponds to the measured distance between the camera and subject.

A test to determine accuracy of lens alignment in the camera is made as follows: A 3-ft.-square test sheet of white wallpaper or dull-finished oilcloth having a very distinct pattern is taped to a wall as in Fig. 14. The sheet should be perfectly flat and centered about 3½ ft. above the floor. A length of black tape or heavy black line is applied to the test sheet vertically over its center. Then, the camera is positioned at a 45-deg. angle from the wall exactly 4 ft. from the lens to the tape. The test sheet should be illuminated uniformly as determined by a light meter. "Bounce" lighting is best for this purpose.

Next, with the lens aperture fully open, photograph the test sheet, and repeat from a distance of 10 ft. at the same angle. Under-expose the negative slightly so that it will be relatively "thin." If this is carefully done, the tape and a small area on either side of it

should show up in very sharp focus. If the area of sharp focus centers on either side of the tape, the distance between the lens and the film plane is incorrect in relation to the readings on the focusing scale. Many cameras have adjustments to correct such errors. A misaligned lens mount also can cause either end of the tape to be out of focus. After taking such close-up photos, make a head-on exposure of a contrasty building with the camera set at infinity. This should produce an image of uniform sharpness over the entire negative. If it does not, some type of repair may be necessary the extent of which can be determined only by a competent repairman. Never buy a camera that does not operate properly, even when allowance is made for necessary repairs. Until repaired, an inoperable camera can't be given the various checks necessary to determine its mechanical condition and quality of the lens. ★ ★ ★





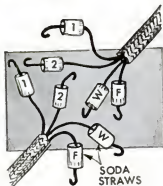
## Handy Memo Pad Attached to Wall-Mounted Telephone



Writing on a memo pad while using a wall-mounted telephone is no problem when this simple accessory is fitted to the board on which the phone is mounted. A length of copper or brass flat stock is bent as indicated to support a piece of 1-in. pine measuring about 5 x 7 in. The bracket is drilled and attached to the phone board with wood screws. The memo pad is thumbtacked to the board as shown.

## Straw Sections Mark Wires

There will be no confusion as to which wire connects to which when reassembling an electrical hookup if the corresponding wires are marked with numbered sections of soda straws when parted.



## "Haircut" for Paintbrushes

If the outside bristles of paintbrushes become frayed and worn, they may be removed easily. Using a hacksaw blade as a guide, insert it between the good bristles and the unruly ones. Then with shears or snips merely trim the frayed bristles, without danger of cutting the good ones.

## Carpeting Used as Tree Mulch

Pieces of discarded carpeting are used by one homeowner as "mulch" around young fruit trees. A hole is cut in the center of the carpeting, which then is slit and fitted around the tree trunk. Rocks are used to keep the carpeting in place.

Bil Toman, Palatine, Ill.



## Sponge Oils Overhead Pulley

An overhead pulley that is difficult to reach may be lubricated with an oil-soaked sponge tied to the rope or cable. The sponge should be large enough so that it will be squeezed as it passes through the pulley, which will cause the oil to run down onto the pulley shaft.

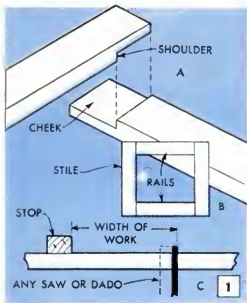
## "Custom Made" Wrecking Bar

To extend the "reach" of a wrecking bar, and to reduce the chances of splitting lumber being pried, one farmer modified the bar as shown. It first was bent as indicated, then an angle and brace were welded to the lower end. The bar was extended by welding on a length of pipe.





## SHOP NOTES

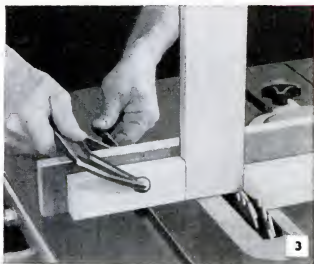


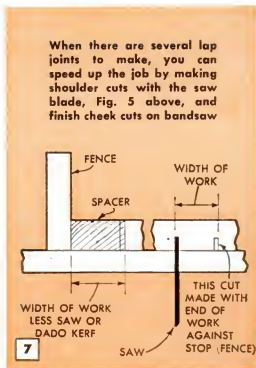
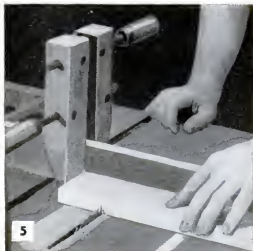
# How to Cut Lap Joints SN 59

By Sam Brown

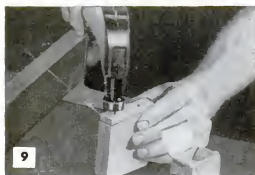
**I**F YOU MAKE your own screen frames or storm sash, frame hardboard panels or build a sawbuck table, you will need to make very accurate lap joints. The end lap is the simplest to make, either by hand methods or complete on the circular saw. The cross lap, or middle lap, requires a bit more care when making the setup. The same is true of the oblique lap, or angle lap, as it is sometimes called. When made accurately and then joined with glue and wooden pins, the end lap makes a strong, serviceable joint for the four corners of a frame such as that for a storm sash or screen. Where appearance of the finished job is of some importance it should be remembered that a frame assembled with lap joints at the corners generally looks best with the stiles unbroken as in Fig. 1, detail B. The assembly should be planned and the joints cut accordingly.

When making the end lap on a circular saw the stiles (vertical members) and the rails should be cut to final, or net, length. The shoulder cut is made with the saw blade or dado set to cut half the thickness of the stock. Be sure that this setting is accurate, then locate the stop block (a clamp also can be used, Fig. 5) and clamp it in position. Note that the stop is located from the far side of the dado head (or saw blade) and that the distance is equal to the width of the stock, Fig. 1, detail C, and also Fig. 3. If you use the miter gauge without a facing board, then the ripping fence





When making cross lap, an accurate spacer block is essential. Make one as in Figs. 8, 9



can be used as a stop, Fig. 4. The initial, or shoulder cut, then is made as in Fig. 2. When running the end lap on the power saw there are two ways of removing the waste. The first is by repeated passes over the dado head, shifting the stock after each pass, or by running the shoulder out first as in Fig. 5 and finishing with the cheek cut made on the band-saw as in Fig. 6. The former method is perhaps the most accurate.

The cross or middle-lap joint is generally used to join two pieces of stock at the center to form a cross. When accurately made it's a strong, durable joint. Although the shoulder cuts can be made to pencil marks alone with reasonable accuracy, it's better to make the setup with a stop (the saw fence) and a spacer block. The spacer should be of a length equal to the width of the work less the width of the saw or dado kerf, Fig. 7. The best way to make a stop block is to remove the kerf width from a scrap piece of the work stock as in Fig. 8 and then nail the two pieces together as in Fig. 9. Fig. 10 pictures a block made in this manner being used to set the second shoulder cut, the first shoulder cut having been made with the fence used as a stop.

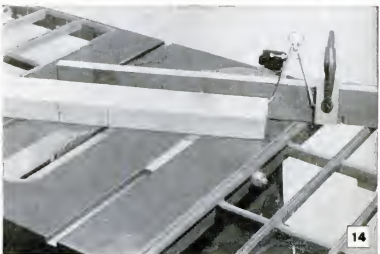
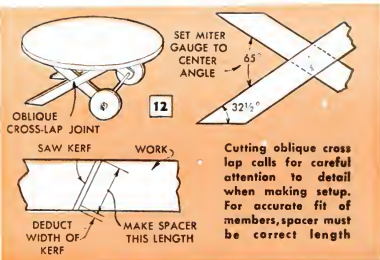
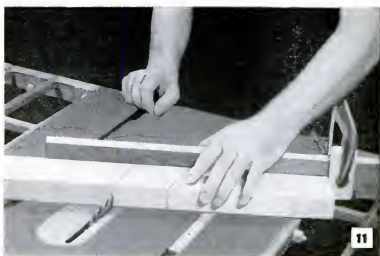
Cutting the oblique cross lap, Fig. 12, requires careful attention to detail when making the setup.



Both members of the joint are cut in the same way with the miter gauge at the same angle and on the same side of the saw table. Cut the stock to the net length and square across the ends. Do any additional cutting after the lap cuts have been made. Pencil the position of the joint on one member and mark the ends that are to be placed against the stop with the letter "S" for easy identification. The miter-gauge setting is the same as the angle of the work, Figs. 11 and 12. Note that the angle cuts to level the assembly, that is, the cuts made on the ends of the stock, are half that of the center angle, Fig. 12. If a spacer block is used, its length must equal that of the angle cut across the work less the width of the saw kerf, lower detail, Fig. 12. However, a somewhat better way is to pick off the spacing distance with inside calipers as in Fig. 13, and then use the caliper setting to space the cuts, one leg of the caliper bearing against the stop block as in Fig. 14.

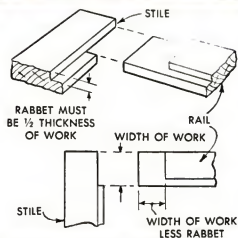
Figs. 15 to 18 inclusive show how to cut an end lap with rabbet. When cutting this joint keep one rule in mind: the rabbet depth must always be one half the thickness of the workpiece. Note the upper detail, Fig. 16, also Figs. 17 and 18. One good way to assure an accurate setting of the saw or dado for cutting the rabbet is pictured in Fig. 15. Make two cuts, one on each side of a piece of scrap stock of the same sectional dimension as the material to be joined. If the cuts are even as shown, the setting is correct. For convenience, the width of the rabbet is made the same as the depth as this permits sawing it with the same fence setting, Fig. 16. Otherwise cutting the end lap with rabbet is much the same procedure as cutting the ordinary end lap except, of course, the length of the cut portion on the rails is shorter by the width of the rabbet, Fig. 16, lower detail. Note also the cut pictured in Fig. 18.

Some forms of the lap joint require right and left-hand cutting. An example is the mitered end lap, Fig. 19. Figs. 20 to 24 inclusive picture the procedure. First, you cut the stock square and to the net length. Next, you cut a plain miter on the rails as in Fig. 20. When





15



cutting the miters make sure that the stock does not creep along the miter gauge as the cuts are made. Then, with the saw blade set to cut only half the thickness of the stock, run a mitering cut on one end of all the stiles, Fig. 21. Now, with the blade at the same setting, swing the miter gauge to the opposite side of center and cut the miter on the opposite end of each of the stiles, Fig. 22. This requires resetting the end stop. As the final step in this series of operations you run a shoulder cut on



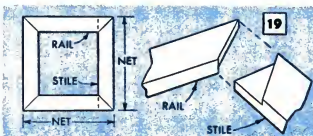
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18



19

Mitered and lap is best of all lap joints appearancewise. When joined, stiles and rails appear as plain mitered at the corners. Care in making the setup on circular saw will assure accurate fit. Photos below and on opposite page picture the procedure



20



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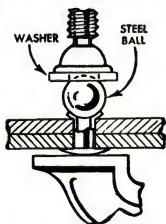




each of the rails as in Fig. 23, making sure that the stop (in this case the fence) is set to locate the cut at the precise corner of the miter. It's important to make sure of this setting; otherwise the joint will not fit properly. The last step is removing the waste from the shoulder cuts and this can be done with the dado, or faster still, with a molding head fitted with square cutters as in Fig. 24. The mitered end lap makes the neatest joint of all as the joints appear as regular miters when placed with the face side out as in the left-hand detail in Fig. 19. Before cutting any end lap, cross lap or mitered end lap be sure that all pieces are of uniform width and thickness. ★ ★ ★



## Steel Ball Sets Hollow Rivet



In an emergency, when no conventional rivet set is at hand, you still can set a hollow rivet perfectly simply by using a C-clamp and a steel ball. Drill holes in the joining parts, insert the rivet and then locate the ball and C-clamp as detailed. It is necessary

to place a washer on top of the ball as indicated in order to obtain straight-line pressure.

## Keep Soldering Iron Clean

A steel-wool pad pressed loosely into a small can makes an efficient cleaner for the soldering-iron tip. Use a medium steel wool, No. 1 or 2. Attach the can to the bench or to the wall over the bench so that it is within easy reach. Clean the iron while it is hot by pressing the tip into the wool pad and turning right and left.

APRIL 1958

## Thumbtack Tightens Cover

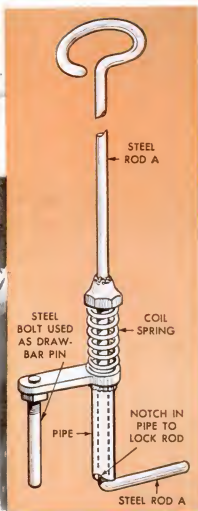
Friction covers on wooden drill cases, also those for letter and number stamps, often become loose due to hard usage. The cover can be made a tight fit again by driving a small tack in the position shown in the detail. On larger wooden cases, such as those supplied with sets of letter and number stamps, a thumbtack is suitable for the purpose.



## Thin Splines for Miter Joints

Thin stock salvaged from fruit crates makes excellent splines for mitered joints when cut into strips across the grain. Usually it's just the right thickness to fit snugly into a 1/8-in. groove which you run with the outside cutter of the dado head. For mitered joints on narrow stock, cut splines from hardwood veneers.

211



## Coupling Implement From Tractor Seat

When every minute counts in getting field work done, this handy coupler can save both time and steps. After a glance at the detail you'll know how it's made. A few minutes spent in the farm workshop with the welder and you have it ready to use. It combines a lifter and clevis pin. The rod A, bent at right angles near the lower end serves as the lifter. The rod carries the spring-loaded clevis-pin assembly. As you inch the tractor back you pick up the im-

plement drawbar as pictured. When the clevis-pin holes line up, you swing the pin into position and drop it into the holes, thus coupling the implement to the tractor drawbar. Then you lock the pin in place by turning the handle of the lifter until the bend at the lower end springs into the notch filed into the lower end of the pipe sleeve which is welded to the arm carrying the pin. Once the handle is turned to this position the pin cannot come out.



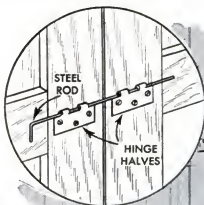
### Pickup Box Mounts on Tractor

This pickup box mounts on the three-point hitch of the tractor and can be raised and lowered as desired. It's 72 in. long, 28 in. wide and 36 in. high, including the rack sides. It will handle two barrels of water or six to eight sacks of ground feed for a quick run to a self-feeder in field or pasture. With the rack sides, or open extensions, the box is suitable for transporting sheep or hogs. It is built of pine 1 x 4s, matched flooring and is braced with lengths of  $\frac{1}{4}$  x 2-in. flat steel.

A. M. Wettach, Mt. Pleasant, Iowa.

## Emergency Door Bolt From Leaves of Butt Hinge

Leaves of a discarded butt hinge can be utilized to make an emergency door bolt for a garage, shop or other outbuilding having a door or doors that swing out. Remove the hinge pin and, where double doors are to be bolted, attach the leaves as pictured, with the barrels in line. Use a length of steel rod, bent at right angles near one end, as a bolt. To bolt a single door use one leaf of the hinge and a shorter bolt. Drill a hole in the jamb to take the end of the bolt when in the closed position. — Victor H. Lamoy, Upper Jay, N. Y.



## Watch and Matches Kept Dry In Jar While Boating



A widemouthed jar wired to a shelf fastened inside the boat will protect your watch, matches and cigarettes from spray and dampness. Place a handkerchief or cotton behind the watch to hold it erect so the dial can be read.

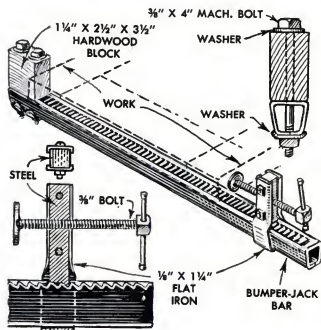
## Preventing Spilled Water From Staining Rug

To prevent stains when water is spilled on a rug, immediately blot up all the water possible with a clean, white, unstarched terry cloth, white absorbent tissues or white paper towels. When the spot has been dried as much as possible, place fresh towels or tissues on the wet area and add weights on them to assure close contact between the blotters and the rug. The towels must remain in place until the spot has dried completely.

National Institute of Rug Cleaning, Inc.

## Adjustable Bar Clamp Made From Auto-Bumper Jack

An inexpensive bar clamp can be made by using the standard from an automobile bumper jack. A hardwood block is bolted to one end of the standard to provide a



fixed jaw. A movable jaw is made by bending a length of  $\frac{1}{8} \times 1\frac{1}{4}$ -in. flat iron in a squared-U-shape to fit around the bar. A steel block, the lower end of which is filed to a pawl shape to engage the rack on the column, is bolted in the U-shaped jaw. The steel block is positioned so the jaw can be moved in either direction along the rack when it is held upright, but will engage the rack when tipped slightly. The steel block is drilled and tapped to receive a  $\frac{5}{8}$ -in. bolt which serves as the clamp screw. A short length of  $\frac{1}{4}$ -in. rod fitted in a hole cross-drilled in the bolt head provides a sliding handle. A disk welded to the opposite end of the bolt forms the clamp-screw pad. — Charles A. Churnblom, Minneapolis, Minn.

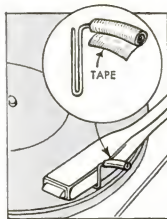
☐ Curtains or garments that are to be dyed can be given a more even color if two spring-type clothespins are fastened at suitable places on the article and used as hand-grips to swish the material up and down in the dye bath. This distributes dye evenly and keeps hands out of the solution.



### Sticking Sash Easily Removed

Removing a storm sash that sticks may take some doing by ordinary methods, and even then you'll be lucky if you can turn the trick without damaging the sash frame. Pictured is a method that usually works, and the only damage to the sash frame are the two screw holes, which are easily filled with putty. Use round-headed screws and turn them in about  $\frac{3}{4}$  in. A light pull on each screw usually loosens the sash.

### Handy Lifter for Pickup Arm



A lifter on the pickup arm of the record player can save a lot of wear on the records. Make the lifter from a short length of fine wire, bending it so that it will snap onto the edge of the arm. —Steve Ackermann, Meadowbrook, Pa.

### Rubber Bands Save Old Broom

Don't throw away that old broom with frayed and spreading bristles. Just soak the bristles in water for a few minutes and then snap a couple of heavy rubber bands around them below the stitching. Remove the bands after the bristles are dry, and the broom will be nearly as good as ever.

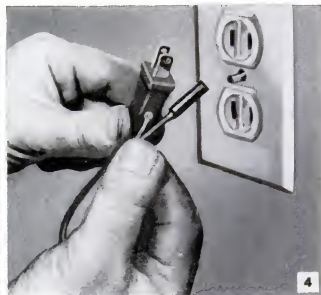
## THAT THIRD

can reduce electrical-shock hazard in older home appliances and portable power tools

**I**N NEW HOMES wired with electrical systems of the continuous-ground type, which requires that appliances be equipped with three-prong plugs, the shock hazard is reduced to the minimum. On the other hand, in older homes having two-wire electrical systems there is always the possibility that defects in appliances and portable power tools due to wear, deterioration of insulation or other causes, can create a serious, if not dangerous, shock hazard. Any hazard that may exist due to these causes is increased in the presence of dampness, as in a basement where humidity is high during summer months.

Older appliances such as wringer-type washers and any motor-driven tools having two-wire power cords, A in Figs. 1 and 2, can be grounded with a third wire, B in Figs. 1 and 2. One end of the third wire, or ground wire, should be attached to bare metal on the appliance or tool as in the inset detail, Fig. 1. The other end should be attached to a water pipe with a suitable ground clamp as in Fig. 5. In this procedure it should be understood that you are not necessarily guarding against a defect in manufacture, but against the outside chance that an electrical defect may exist in the tool or appliance due to hard usage, undue wear or other causes of which you may not be aware.

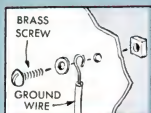
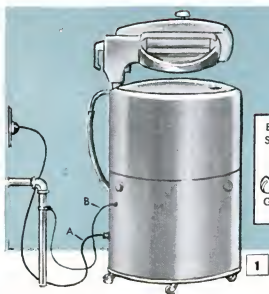
Some tools and appliances made in later years come with a three-wire power cord having a two-prong plug and a pigtail (green ground wire) leading out from the





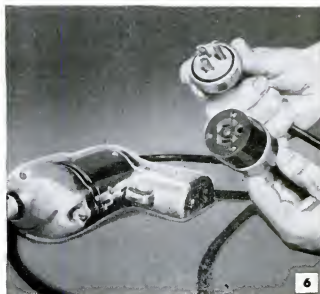
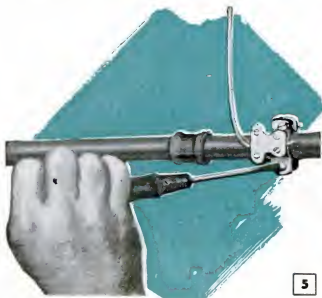
## WIRE

By Ralph Treves



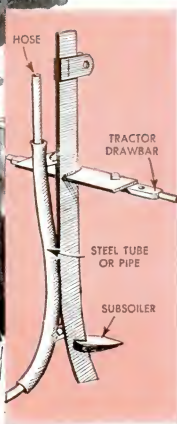
side of the plug, Fig. 4. Often this is fitted with a special screw which replaces the screw holding the cover plate of the receptacle. This is an effective ground on systems installed in BX, rigid conduit or thin-wall conduit. Late-model equipment comes with a three-wire power cord, a three-prong plug and an auxiliary plug, or jack, having a two-prong end and a pigtail for attaching the ground to the receptacle as in Fig. 3. Be sure the screw is tight.

When a portable electric drill, saw or other power tool must be operated at a distance from an outlet which is beyond the reach of the regular power cord, an extension must be used. When the tool is equipped with a three-wire cord, always use a three-wire extension having plugs as in Fig. 6. Use of such an extension will assure that the tool is properly grounded to insure working safety. ★ ★ ★



SN ~~1111~~ 59

## Subsoiler Lays Hose Underground to Watering Tank



This shop-made subsoiler is designed to double as an underground hose layer. It consists of a conventional unit with a vertical beam to which is welded a bent steel tube to carry the hose down to the level of the subsoiler blade. It will lay hose to a distant water tank or poultry waterer in a few minutes' time.

## Tiny Saw Blades From Clock Gears

An escapement wheel or the solid wheels from gear trains of an old clock movement make excellent circular saw blades for model work in balsa and other soft woods. The saws can be driven in the drill press or by means of a flexible shaft. File and set the teeth as you would a conventional blade.

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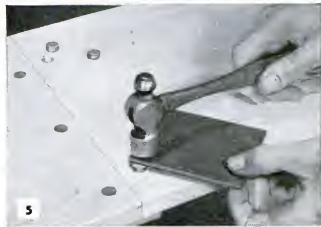
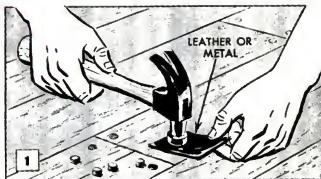
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# SCREW-HOLE PLUGS MADE FROM DOWELS

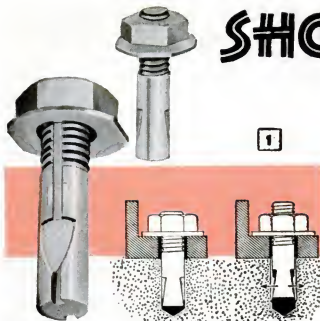
SN 59

HERE'S A METHOD of making screw-hole plugs fast and in quantity. First, you drill blind holes to a uniform depth in a piece of waste stock. As will be seen, the depth of the holes determines the length of the plugs. Of course, the holes must be the same diameter as the dowel. Cut the latter into short lengths, each length slightly greater than the depth of the holes in the waste piece. Press the rough plugs thus made into the holes in the waste piece as in Fig. 2 and sand flush as in Fig. 3. Then split the waste piece into sections to release the plugs as in Fig. 4. To avoid damaging the ends of the plugs use a leather or soft-metal pad when tapping them into counterbored screw holes as in Figs. 1 and 5. Plugs made in this way are used to conceal screw and nail heads in boat construction, ranch-type flooring and cabinetwork. When plugs are used to conceal screwheads in ranch-type flooring they can be made from a contrasting wood, such as walnut or birch. Make them full length with a plug cutter, then finish to size as in Figs. 2 to 5 inclusive.

R. Hanscom, Elmhurst, Ill.



# SHOPPING FOR



1

**1. ONE-PIECE ANCHOR** for masonry eliminates use of expansion sleeve. In place of sleeve a U-shaped wedge expands when the nut is tightened. The wedge fits flush in a groove and heart-shaped recesses cut in opposite sides of the stud or bolt. In use, anchor unit is passed through hole in bracket, machine base or whatever is to be fastened, inserted in hole, drilled in masonry and nut tightened.

Kirel, Inc., 322 E. 28th St., New York City 16.

**2. PORTABLE JIGSAW** has motor at right angles to blade, rather than parallel with it. Driving mechanism is designed to give blade an orbital motion, moving blade away from material on down, or idle, stroke and forcing it into material on upstroke. This movement of blade results in faster cutting and cleaner work in wood, plastic and the softer metals. Blade is driven at 3800 strokes per min. Tool weighs 5½ lb.

H. K. Porter Co., Inc., Henry Diston Div., 610 Tacoma, Philadelphia 35, Pa.



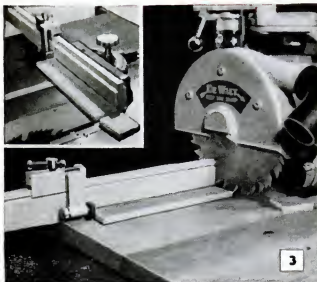
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**3. ADJUSTABLE STOP** for repeat cuts on radial saw or table saw has pivoted arm which permits stop to swing upward to clear face of fence or miter gauge for cutting longer stock. This can be done without changing original setting of stop. Unit slides on grooved hardwood strip attached to miter gauge or to grooved strip which is made to replace fence on radial saw table, allowing a wide range of adjustment.

R. W. Anderson Co., 1110 W. 68th St., Los Angeles 44, Calif.

**4. TWO-LINE STRIPING TOOL** comes with interchangeable striping wheels and spacers which can be assembled to run a single line, double lines of equal width, two narrow lines or two wide lines, or one wide and one narrow line in one pass. Works with enamel, lacquer, tempera, bronzing paint or any oil-base paint. Guide is adjustable and is designed to follow beads, moldings, straightedge or template.

Wendell Mfg. Co., 4234 N. Lincoln Ave., Chicago 18.



3



4



# TOOLS

**5. HYDRAULIC SCAFFOLD** is operated by a control unit located on the platform. It will rise to a total height of 10 ft. and can be locked securely at any point. Designed for use by painters, carpenters and masons, and also is used by orchardists when tree pruning. Working area of platform is 2½ x 8 ft. Guard rail is standard equipment

Grell Enterprises, Galva, Iowa.

**6. POWER HACKSAW BLADE** has teeth set to a graduated width along the full length of the blade. The purpose of this graduation of the set is to lessen blade shock at start of cutting stroke, also to reduce wear on points of entering teeth. Set widens uniformly from the entering end to the finishing end of the blade as detailed

E. H. Wachs Co., 1525 N. Dayton St., Chicago 22.

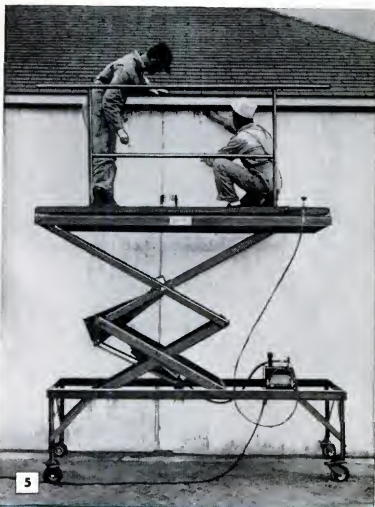
**7. ELECTROTHERMAL UNIT** replaces Bunsen burner in laboratories and in industrial research where clean, controlled heat is essential for experimental work. Heating element is mounted in a conical casing, or housing, of refractory aluminum oxide, designed so that heat is concentrated in the same manner as that from Bunsen burner

Gardner Laboratory, Inc., 5521 Landy Lane, Bethesda, Md.

**8. MASON'S LINE CLIP** holds the line in place on all types of masonry walls. No nails or other fasteners are necessary to attach clip to brick, block or stone walls. It is designed to span the width of a standard brick as pictured. It also will hold on a corner or when dropped over the web of a concrete block. Will not slip out of place

Retco Mfg. Co., Brazil, Ind.

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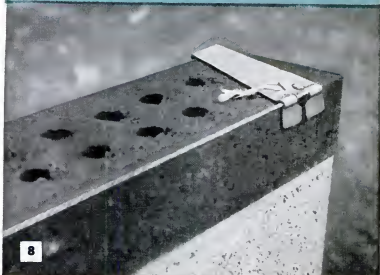


ENTERING TEETH,  
NARROW SET

FINISHING TEETH,  
HEAVY SET



6



# SHOPPING FOR TOOLS

(Continued from preceding page)



**9. AIR-CURRENT DIRECTION FINDER** uses ordinary cigarette, regular or king size, for determining with certainty the direction of air currents either in a building, or other enclosure, or outdoors. In use, cigarette is lighted, inserted in holder and nozzle is screwed in place. Then bulb attached to holder is pressed lightly to force smoke through nozzle

Design Engineers, 214 S. Church St., Rockford, Ill.



**10. PNEUMATIC OILER** for air-driven tools such as staplers, wrenches, drills and riveters assures controlled lubrication to all parts of tool during long periods of operation. Unit is of injector type, made from lightweight metals with brass and stainless-steel operating parts, and is fitted with direct-reading oil gauge. Unit is  $3\frac{1}{4}$  in. long,  $1\frac{1}{2}$  in. in dia.

Carlson Products, Inc., 5309 N. 24th St., Omaha 10, Nebr.

**11. PISTOL-GRIP HANDLE** converts any pressurized spray can into a professional-type spray gun. Fits any pressurized can containing enamel, insecticide, deodorants or other sprays. Pressure on trigger of attachment actuates an arm which bears on spray cap of can. Pistol-grip handle provides comfortable handhold, enables user to direct spray with accuracy

Alfeo, Inc., 2031 Granville Ave., Los Angeles 25, Calif.



**12. SELFLOCKING CLAMP** has a 5-position cam which locks the padded jaws at any one of the 5 positions desired. Easily set and locked on the work with one hand, leaving other hand free to hold parts in position. Especially useful for light assembly as rubber-faced jaws will not score finished surfaces. Jaws are replaceable. Length  $4\frac{1}{2}$  in. Jaws open 2 in.

Wedgetock Corp., 5446 Satauma Ave., North Hollywood, Calif.



**13. PLUNGER-ACTUATED OILER** has many applications in the home and workshop. Nozzle is designed to direct a very fine stream of light oil into hard to reach bearings such as those on lawn mowers, motors and household electrical appliances. Container holds up to 4 oz. of light lubricating oil and is made from transparent plastic. Base unscrews for easy filling

Piewes Oiler, Inc., 701 S. 7th St., Minneapolis 15, Minn.

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New Brownie Starflash Camera takes color slides as well as black-and-white and color snapshots. Built-in flashholder. Double exposure prevention. Brownie Starflash Camera, \$8.95 or \$1 down.

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New Kodak Pony II Camera for 35mm color slides. Just dial for picture you want. Make one setting, shoot. Kodak Pony II Camera, \$26.75 or \$2.75 down. New Kodak Generator Flashholder works without batteries! At your photo dealer's soon.

New Kodak Signet 50 Camera for precision photography has built-in photoelectric exposure meter. Extremely fine  $f/2.8$  lens. Flashholder, two reflectors. Kodak Signet 50 Camera, complete, \$82.50 or \$8.50 down.



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Brownie Movie Camera,  $f/2.3$  (left), takes color movies with snapshot ease. Just make one setting . . . aim . . . and shoot! Brownie Movie Camera, Turret  $f/1.9$  (right), gives you 3-lens range at 1-lens price — takes normal, wide-angle, telephoto shots. Brownie Movie Cameras from \$29.95 or \$3 down.



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New Kodak Medallion 8 Movie Camera,  $f/1.9$ , loads in 3 seconds with film magazine, weighs only 23 ounces. Kodak Medallion 8 Movie Camera,  $f/1.9$ , \$106.50.

Shows color slides big-as-life. Kodak 300 Projector is only 5 inches high, easy to carry as a portable radio. Kodak 300 Projector, \$64.50 or \$6.50 down. New Kodak Cavalcade Projector shows slides *automatically*! You turn it on . . . it does the rest. At your dealer's soon!

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# Clinic for Homemakers



As a service to our readers in solving the hundreds of problems pertaining to a home—inside or out—the editors of *Popular Mechanics* invite you to present your problems to The Clinic Editor for help and advice. Address your questions to The Clinic Editor, *Popular Mechanics Magazine*, 200 East Ontario Street, Chicago 11, Ill.



## Spackle Over Paint

**Q**—Walls in my living room are rough-textured plaster from the baseboard to the picture molding which forms the lower edge of the drop ceiling. It's an old house and I want to enlarge the living room, and in doing this I will have

to lower the picture molding, thus exposing about 4 in. of the rough texture. The walls have been painted. Can I smooth these rough-textured portions with spackling compound?—R.D., Del.

**A**—We do not know that every manufacturer of spackling compound would recommend this procedure but, of course, it is done. As we understand your problem you wish to smooth a strip about 4 in. wide around the room just above the lowered molding in order to match that portion of the drop ceiling which was originally above the molding and is smooth plastered. This means that there will be an offset at the point where the spackling compound is feathered onto the smooth plaster. Question that comes to mind is, can this be satisfactorily concealed by subsequent wall decoration such as paint or wallpaper? We're rather doubtful. We think it worthwhile to think about removing the rough texture above the molding by sanding. You can do it by hand, using a coarse, open-coat sandpaper or with a portable belt sander. It is likely you can rent the latter from your local paint dealer for a nominal hourly charge. It's a tedious, messy job at best and the fine plaster dust is difficult to clean up but we think this is the most satisfactory solution to the problem as you outline it.

## Moisture Condenses on Walls



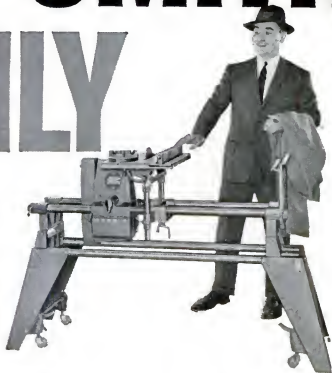
**Q**—The walls of our home are of concrete blocks and the floor is a concrete slab. Other than that we do not know the details of construction. Last winter the walls sweat badly, especially the north outside wall from the ceiling to a point about 2 ft. down.

Heating is forced warm air with ducts in the floor. All windows are aluminum sashes with storm inserts. These also sweat. Are there any preventive steps we can take before the next heating season?—E. C., Ohio.

**A**—The most likely moisture source is, of course, the high humidity of the air in the room. Moisture from the preparation of meals, laundering, from

(Continued to page 226)

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# Sealed Power

## PISTON RINGS

BEST IN NEW CARS! • BEST IN OLD CARS!

(Continued from page 224)

the shower and possibly the furnace humidifier contribute regularly to the relatively high humidity level in the house. The walls and metal window sashes and the glass panes are colder than the air in the rooms, causing the moisture to condense on these surfaces. It's difficult to eliminate the trouble entirely in a home already built, especially one of masonry construction, but there are ways to minimize condensation. Just what is best to do is the problem, but usually a considerable reduction of the indoor humidity can be brought about by bringing in outside air to the furnace by installation of an additional cold-air duct.



## Control Wild Onion

**Q**—My lawn is infested with wild onion; at least that is what the plant is called in this locality. I have various suggestions for getting rid of the plants, but I've only been here one year and none has been carried out. Is it possible to eradicate the pest without rebuilding the lawn?—D.O. Miss

**A**—Wild onion, as it is known in the South, usually starts growth in the fall from old plants as well as from the bulbets. The time depends largely on the amount of rainfall but usually ranges from September to November. By early spring, aerial bulbets begin to form. These drop during the late spring and early summer and sprout in the fall, thus completing the cycle. Because of this peculiarity of the growth cycle it's late in the season for you to obtain maximum results from application of a weed killer, or herbicide. Usually a complete, or near-complete kill can be obtained by applying a suitable herbicide (formulated with 2,4-D) during midwinter when the growth is most susceptible to the weed killers. However, we do think it a good idea to build the lawn, starting immediately with periodic applications of lawn fertilizer, new grass seed, and, if you wish, an application of weed killer, although as has been pointed out, you cannot expect good results so late in the season from the latter.

## Paint Chips From Woodwork

**Q**—The woodwork in my older home was stained dark oak. Last fall I painted it with two coats of semigloss paint. Now the paint is checking and peeling, exposing the dark finish underneath. What's wrong?—W. H., Conn.

**A**—You did not say where the paint is peeling and checking. Usually this trouble develops at points where hands may touch the woodwork for support, as with small children or elderly grown-ups. However, it is possible that a high-gloss varnish was used either in finishing the woodwork originally or as a refinishing coat. As a rule, interior paints do not bond well to a high-gloss finish. This is likely to be your trouble, especially if the paint job shows defects over all the woodwork more or less uniformly. With the paint on all the woodwork, probably the best thing to do in your case is to sand it thoroughly with a fairly coarse sandpaper to remove all loose material. Then apply an undercoater which is prepared for the purpose.

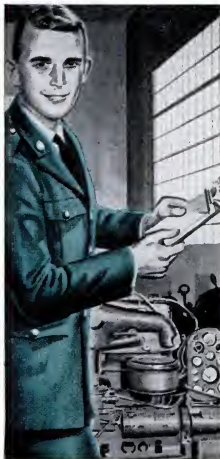
## New Basement Floor Over Old

**Q**—My basement floor is quite old but is still in good condition. However, the fall to the drains is much more than necessary, being about 5 in. and resulting in depressions in the floor and rather steep slopes around each drain. I'm thinking of leveling the floor to give a fall of about 1 in. to the drains. Can I do this by filling the depressions with new concrete?—L.E., Mich.

**A**—You can, of course, do the job as you suggest, but the problem is the necessary feathering of the new concrete at the point where the floor levels at the edges of the depressions. The new concrete may fall to bond to the old at these points. It's better, we think, to break up the old concrete in the depressions, removing it entirely back to the points where the floor leve's and then filling to the desired level around the drains with new concrete.



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• Pvt. Charles R. Corrico, Springfield, Ky.



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• Pvt. John D. Finley, Colebrook, N. H.

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## Push a Button and You Make Beef

(Continued from page 136)

have to do with storage bins, batch-mixing system, haymill airlift, barley roller, molasses spray-mix system, and the moving of prepared feed storage.

The other panel has two sets of control dials. One group is for setting the amount of feed by exact weight that will come out of the feed-storage bins and be mixed into each batch of finished feed. The second set makes possible the delivery of batch after batch of feed while the operator goes about other chores.

Each of the control buttons and dials has a connecting red light to warn that the unit controlled by that button has completed its work. If the operator has to be away from the control panel he sets a dial that causes a horn to blow each time a unit has completed its task.

In the feed building, near the panels, there are a mineral mixer and storage hopper for salt, trace minerals and special chemical foods, a barley steamer and roller, and a molasses-control unit. Above these are four large feed bins, one each for eight tons of chopped hay, 35 tons of ground grain, 30 tons of rolled barley and 15 tons of whole barley. Adjacent to them are four small bins, each with a seven to eight-ton capacity, for such concentrates as cottonseed meal, sugar-beet pulp, almond-hull meal and ground dried beans.

### Dial the Formula

Each of these units, with the exception of the molasses-introduction machine, is connected to a combination batch scale-mixer by elevators, augers or airlifts.

When feed is mixed, the operator selects the desired formula, then sets the electronic dials on one panel so that the correct weight of feed will move to the scale-mixer from each storage unit. He then pushes in a proper sequence the buttons on the other panel that control the conveying devices and the feed begins to arrive at the mixer.

When mixing is complete, the scale-mixer automatically empties into an auger that lifts the feed to the molasses-introduction machine. As the feed is taken through this machine by a paddle mixer-conveyor, molasses is sprayed on it. Coming out of the machine the feed drops onto another conveyor which lifts it to four big finished-feed bins outside the building.

Feed is taken from the bins by two five-ton delivery trucks that are driven along beside 10,000 feet of corral manglers. They deposit feed via augers.

(Continued to page 230)

POPULAR MECHANICS

# Which Springfield Tiller do you prefer?

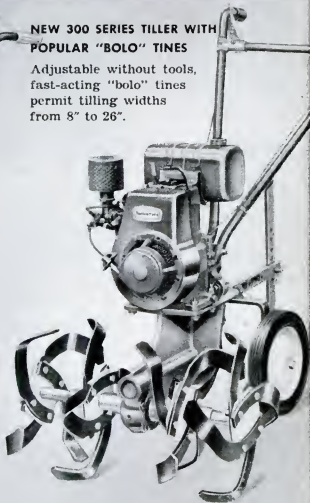
## NEW 200 SERIES TILLER WITH EXCLUSIVE SPRINGTIL TINES

Vari-width Tines, individually removable without tools, permit tilling widths from 7½" to 21½".



## NEW 300 SERIES TILLER WITH POPULAR "BOLO" TINES

Adjustable without tools, fast-acting "bolo" tines permit tilling widths from 8" to 26".



Here are two sturdy "little giants" built to plow, weed, cultivate and pulverize in any man's garden. Featuring self-sharpening tines that are guaranteed for life against breakage, both models offer Springfield's exclusive Quick-Lok Clutch on the handle bar to eliminate unnecessary armwork. Tines and transport wheels are easily adjusted to till wide or narrow rows. Depth bar permits tilling of shallow or deep furrows. Powerful 4 cycle engine "works" the garden, not the gardener.



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Keep your rotary mower  
blade sharp all summer  
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Rotary Mower file by Nicholson lets you sharpen your blade easily. If your machine is engine-operated, disconnect the spark; if electric, unplug cord.

It's a nuisance to drag your rotary mower off to be sharpened several times a season. The grass doesn't stop growing while your machine is away from home. But a new product by Nicholson solves the problem. Our Rotary Mower file is the first tool ever designed specifically for sharpening rotary blades. Best news of all: it sells for only 98¢, and pays for itself the first time you use it.

The Nicholson or Black Diamond Rotary Mower file comes with a handy hang-up hole for easy storage in your shop or garage. And every file comes with its own protective plastic sheath.



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**NICHOLSON FILE COMPANY**

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(In Canada: Nicholson File Company of Canada Ltd., Port Hope, Ontario)



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A FILE FOR EVERY PURPOSE

## Cattle Can Be Finicky

One of the old systems used by cattlemen to fatten out was to chop hay and mix grain with it. Herbert Meyer, a Texas cattleman, was following this procedure when he noticed a few of his animals were getting fat faster than the others. He watched these fast gainers and found they would grab the feed, shake out the grains and eat them only, leaving the hay for the other animals.

"I investigated new mechanical-feeding methods and found that through automation," he says, "I could mix up a formula of hay, grain, concentrates and minerals that would be held together by the highly desirable ingredient, molasses, and that the animals would not shake apart."

He settled for a new feeding arrangement known as the "one-man feed lot." This is a combination of the automatic feed-mixing plant and an automatic feed chain-delivery system that eliminates trucks. The man who operates it stands in one room before a panel of switches and mixes as well as delivers the feed to his stock without even bothering to look out a window.

The inventor of the one-man feed lot is Clay Thompson of Madera, Calif., who for many years was a cowboy on the open ranges of the west. The robot system is so efficient that one man can mix and deliver feed to 500 steers in a half hour.

## Delivers Exact Amount

After feed has been electronically mixed it leaves the mixing room by auger and is dumped onto the dining table. As the first reaches the table, a chain and wooden-bar conveyor is automatically started and the feed is moved along. A preset time schedule determines when the first feed reaches the other end of the table, and the conveyor is automatically shut off. The conveyor courses upward at the end of the table and comes back to its starting point under the roof and out of reach of the stock. The system delivers just enough feed for the number of cattle that are in the feeding corral.

A quarter century ago a steer was all stomach by the time he reached a marketable weight. The beefman was lucky if the carcass yielded as much as 50 percent of its weight in marketable meat, and the housewife was lucky if she got meat that was less tough than leather.

Today the yield, well distributed over the animal under the scientific and automatic feeding, produces a carcass that yields from 55 to 65 percent, and the quality is such that it is rare that a tough cut of meat is found on the dining table. ★★ ★





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## Quick Power When Disaster Strikes

(Continued from page 111)

back to the hospital, but they kept classroom and living facilities for more than 2000 students and instructors in the city's school system operating, and serviced the main telephone exchange.

Emergency power equipment is required in the plans for new hospitals in this country if Burton-Hill federal funds are granted to aid in the building. This is even true of nursing homes for the elderly.

"It is contemplated that in case of an enemy attack on this country, the old folks could be moved to private residences, and the nursing home used as a hospital for the injured," explained Merle Denevan, manager of one of the nation's newest nursing homes in Latah County, Idaho.

Currently, Civil Defense officials are campaigning to encourage farmers to equip their tractors with electric generators. In case of attack, stand-by power would be just as important on the farm as in the city.

But, even without major disaster, the generators attached to tractors would pay dividends to the farmer. They can provide power for portable tools used away from buildings normally served by commercial power. Saws, posthole diggers and welders can all be operated by tractor power.

Also developed has been a new light-weight alternating-current power generator that can be mounted on a truck or auto. It will produce 10 kilowatts at 110-120 volts anywhere the vehicle can travel.

### Stand-by Power Can Be Lethal

Utility concerns go all out to cooperate with anybody installing a stand-by unit—for more reasons than one. Officials say:

"If electricity from a stand-by plant feeds into the utility lines it can bring sudden death to a lineman who thinks the line he is working on is dead. The transformer on the pole outside your place reduces the line voltage from 1200 to 120. But, if energy is fed into it from the house side at 120 volts, it is transformed to 7200 volts as it goes out over the line.

"This situation makes it extremely important that a switch be installed with stand-by plants which will make it impossible for both sources of supply to be connected to the home wiring at the same time, and impossible for the stand-by generator to feed into the utility lines."

Many cities today have set up stand-by power units for their police radio. Typical is that at Erie, Pa. Erie has a stand-by electric plant at its central police station and another at the transmitter several miles away. ★ ★ ★



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### FOR NO CLAMP GLUING

Regular or nonflammable cements that bond on contact. Strong, water-resistant and heat-resistant. Best you can use for plastic laminates, plywood wall panels, leather, linoleum, synthetic rubber, thin gauge metal and all dissimilar materials. Can sizes in pints and quarts.



### FOR GENERAL WOOD GLUING

This powdered casein glue makes strong, water-resistant joints. Works fine on hard or soft woods and many other materials. Mixes easily in cold water and can be used anywhere, even in cold outdoor temperatures. Ideal for laminating beams . . . gluing tables and counter tops, sashes and doors, molding and fixtures. 1 and 5 pound can sizes.



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Chemically neutral, this powdered urea resin glue does not stain acid woods like oak or mahogany. It is highly water resistant and mixes easily in cold water. The perfect glue for fine furniture panels, cabinet work, veneering . . . any job where a clean glue line is important. Available in 1 and 5 pound cans.

Borden Glues are available at hardware, variety, paint and lumber supply stores everywhere. For a free chart which shows the right glue to use for every job, print your name and address on a post card and mail to: Elmer's Glue Chart, The Borden Company, 350 Madison Avenue, New York 17, N. Y.

IF IT'S *Borden's* IT'S GOT TO BE GOOD!

## We Built a Family Room Outdoors

(Continued from page 149)

to leave a portable TV or hi-fi unit (above any dampness of the floor). The duckboards are in four-foot sections so they can be lifted out for storing fuel below.

Almost any barbecue fireplace becomes complicated and expensive when you place it under a roof, but you do want it inside the outdoor room to have its warmth and its barbecuing for all seasons. The answer was very simple. We purchased a 30-inch-diameter portable grill of the common metal-bowl type. With the legs removed, we turned the bowl upside down for a guide and mortared a circle of brick up around it. We made this 24 inches high and it actually resembles a wishing well. Then we mortared three columns of brick up on the inside to support the bowl and mortared it in place. A length of iron rod was welded to the crank which raises and lowers the bowl's grill. At a local sheet-metal shop, we ordered a 40-inch-diameter hood made of 18-gauge galvanized iron, along with a 9-inch-diameter, 7-foot stack or flue to fit.

This fireplace, or fire pit, should be placed where it will not block off the view, interrupt the traffic flow or reduce play and lounging areas. Any outdoor fire-

place will smoke occasionally, so it is best located near the outer side of the room. The weight of the brick and bowl is not enough to require any more foundation than the usual four-inch floor slab. The stack can pass through the asbestos roof anywhere it is four inches from the wood framing, and the hood and stack simply are supported from above by four 1/4 by 1-inch iron straps screwed to the egg-crating and stack.

Good lighting practically doubles the use and glamour of your outdoor room. We used the new Remcon low-voltage system. Any low-voltage wiring system allows you to use nonshocking, small "doorbell" wiring to all switches, but the new Remcon relays do not require a master system or that the entire house be wired with low voltage. In other words, it is a low-voltage system which can be added inexpensively to any house. On the roof of the outdoor room, I located two 150-watt floodlights to outline a large oak tree and to give some lighting throughout the rear yard. On three of the four posts of the room, I placed glass-fiber bullet lamps with 75-watt bulbs, for lighting the barbecue and the barbecue table. You do need bright lights when barbecuing. Walkway lights were placed at various points in the yard.

(Continued to page 236)

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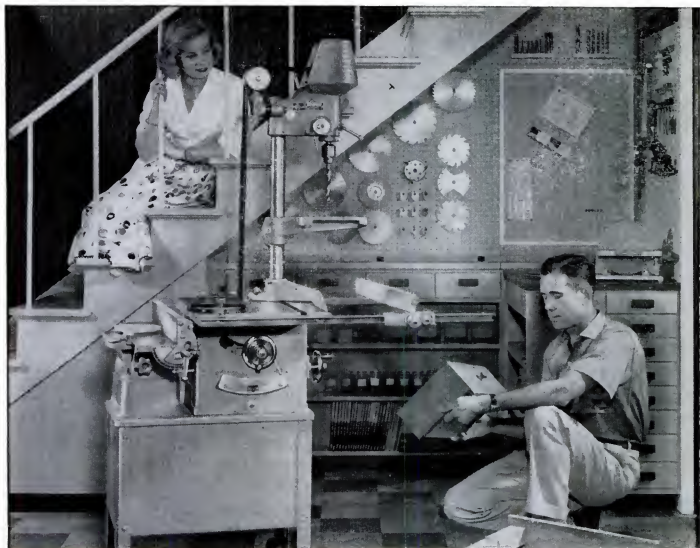
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The best lighting of all, a soft indirect illumination the length of the room, was placed in the house soffit. The roof overhang of our house is the usual—a two-foot overhang with the rafters exposed below. Those rafters looked raw, unfinished, when inside the outdoor room. To cover them, we placed panels of flat, clear glass fiber on the underside. The plastic matches the skylight and simply lies loose on strips of wood molding. A socket for a common 40-watt bulb was centered over each of the nine plastic panels on the underside of the roof. The result, inexpensively, was truly glamorous lighting for the room. If the soffit of your house is already enclosed, or the roof has no overhang, you can obtain a similar effect by mounting a few small floodlights on the roof to shine down through the glass-fiber skylight.

Each of the above groups of lights was controlled by a Remcon low-voltage relay. The wall outlets also were wired to relays. Thus, one button on a master panel inside the house can be touched at bedtime and you know that everything electrical outside the house is turned off. The small switch wiring is inexpensive and easy to install, so I ran it into the garage and buried it in shallow ditches in the yard, to have switches at various points outside to con-

trol floodlights, walkway lights and others.

The barbecue cabinet, like the room, can vary to fit your house and desires. It is built the same as any kitchen base cabinet, of exterior plywood, and the base is the same frame of the duckboard bench. We used 3/4-inch GPX-Yellow, the plastic-coated exterior plywood, to eliminate any chance of deterioration or weather checking. The new plastic-surfaced plywood takes paint and stain the same as wood. The cabinet top is of hard laminated plastic, practically indestructible and easy to clean. A handy feature is the warming tray on the right side of the cabinet. For this, I simply purchased one of the new serving trays which have a glass heating panel in the top. A thin drawer almost like a breadboard was built into the cabinet top to fit the tray (with its handles removed).

Constructionwise, I first had the plans okayed by our local building inspector. The only tough job I encountered was breaking four holes through the patio floor and digging down two feet below to pour concrete foundations for the four posts. To frame the room, a two-by-six plate was anchored along the side of the house above the windows to receive doubled joists from each post. The four doubled two-by-six joists from the posts were secured to the

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wall plate with metal joist hangers (much stronger than toenailing) and with half-inch bolts to the posts. A doubled two-by-eight beam was placed along the top of the posts to carry the roof, and it was notched into and bolted to each post. This was not as fast as nailing, but it used less lumber and gave a stronger, cleaner design.

Most house-roof overhangs are weak and will carry little extra weight without sagging. Ours was no exception. The eggcrate frame of the roof proper was blocked and nailed to the ends of the house rafters, but the weight is actually carried by the four doubled joists underneath. The eggcrating was spaced to fit the room in approximately three-foot squares (anything from 30 to 40 inches will give good support for this type of roofing). The corrugated Flexboard roofing is available in 8, 10 and 12-foot lengths. We used 12-foot lengths and made the total roof 14½ feet wide—to use three-foot lengths of corrugated glass fiber on the skylight and have a six-inch overlap where the plastic and asbestos join. Where the plastic and asbestos rested over the house gutter, no attempt was made to have a waterproof seal. This is a safety factor—if ice or leaves should block the gutter, the water will spill down on our patio floor rather than seep through the house shingles onto ceilings.

The flat walkway roof to the garage was framed with two by sixes, spaced to match the rafters of the house overhang. It extends under the butterfly roof and ties to the doubled two-by-six joist at the end of the outdoor room. Any conventional framing of two-by-four stock can be used to enclose the sides of the room for fly screening. Concrete nails will secure the two-by-four sills of the framing to the floor and the screen frames will slip between the doubled two-by-six joists of each end of the room for good support at the top. Across the front of the room, similar two by sixes at the same level should be secured to the posts, to support the screens there.

My wife and I have found this outdoor family room to be the most usable and pleasurable part of our house. Our young son and his friends play in it, good weather and bad—and so the rest of the house has it easy. Come nightfall and the grownups take over, and when guests arrive everyone gravitates to the outdoor room. Realtors tell us the room adds a good \$2000 to the value of our house, though the material costs were less than \$600. It's hard to explain, but the room is truly an indoor-outdoor area—a transition space that makes our entire rear yard a part of our living area. We find only one problem—we now wonder why we have a living room. ★ ★ ★



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2



3

tips. Look again and be certain a generous portion (at least 10 to 20 per cent) of the bristles have tips which are split or "flagged" (3). Your final assurance of a brush which will give the best painting performance is bristles of varying lengths (4), but with a high proportion of longer lengths.

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4



5

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## The Jet Stream Is the Villain

(Continued from page 99)

temperate latitudes in which live close to a billion Americans, Europeans and Orientals boasts the full name of polar front jet; it meanders above the ever-changing weather front where the cold polar fronts from the arctic meet the warm air masses from the equator. A curious habit is that of splitting unexpectedly into two or more rivers of wind, with vast islands of comparatively still air in between. A few hundred or few thousand miles beyond these forks, the branches may merge again, for this temperamental stream shifts not only north and south, but up and down in elevation. Generally it flows between the 30,000 and 40,000-foot levels. But now and then it suddenly drops, as it did over northern California late in December of 1955, to 10,000 feet, accompanying cloudbursts that inundated several communities, among them Yuba City, which spent Christmas under water.

### Big Winds Blow Fast

The big wind has been clocked blowing 200 miles per hour 40,000 feet above Philadelphia when the surface winds were but breezes. It was once tagged above Spokane blowing a 480-mile gale when the ground winds were gentle zephyrs blowing west. High-flying airmen have reported that above the furious global wind band the atmosphere is almost still.

The jet stream's affinity for forest fires has been revealed by Dr. Vincent Schaefer, General Electric's weather wizard, who traced 21 major "blow-up wildfires" which devastated 365,000 acres of timber in 1955, to the proximity of the big wind. Meteorologist Jerome Namias, of the Extended Forecast Section of the U.S. Weather Bureau cites convincing evidence that the destructive hurricanes of recent years—Ione, Diane, Hazel, Carol and others—swung inland over the Atlantic Coast states because the polar jet stream had shifted its course north and west instead of heading out to sea in the vicinity of the Carolinas.

### What Makes Them Blow?

What makes these violent rivers of air swirl around the earth is good for a debate any time two or more meteorologists get together. There is agreement on this much: the jet streams are cradled in the sky layers where the heavier lower atmosphere, known as the troposphere, meets the lighter, thinner upper atmosphere, the stratosphere. This layer slopes from about 60,000 feet above the equator to around 30,000

(Continued to page 242)





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## On the Trail of Meteorites

(Continued from page 119)

ground by a meteorite was not even burned by the once-fiery chunk of metal.

In the Meteorite Museum are more than 10,000 meteorite specimens found in 38 states and 49 foreign countries. Many of these Dr. Nininger has acquired by trading. Others he has been called in to identify. These he buys if the owners will sell, paying one dollar an ounce and up for the smaller ones, one dollar a pound and up for the larger ones. But the gems of the collection are the shooting stars he has found himself.

### Narrowing the Search

The pursuit often ends in frustration, just as it does for the police hunting down a wanted criminal. And it calls for the same bulldog tenacity. One summer he was driving through the West when he heard of a farmer who had seen a meteorite go scorching across the night sky over his hay barn.

He found the farmer, obtained from him the meteorite's compass course and drew a corresponding line on a map of the area. The hunt was on. He drove in a great circle, stopping frequently to make inquiries, adding new lines to his map until they began to converge on one small area. It took him a week of questioning people who had seen the meteorite, or who vowed they had seen a flying saucer or an airplane in flames, to narrow the area to an ellipse containing about 15 square miles.

### Doorstops From Outer Space

He now entered the bracketed area and tried to pinpoint the exact spot where the meteorite had plunged to earth. It had fallen in a fairly well-populated farming area, but no one had seen or heard it fall. He could only conclude that it was the stony type, that it may have weighed tons as it traveled through space but had ended up as dust. If it had been metallic and had landed intact—or in fragments—he would have continued his pinpointing, finally using a modified land-mine detector.

The layman rarely recognizes a meteorite when he finds one. One meteorite that Dr. Nininger found was being used as an anvil on a ranch. Another had been forged into a crowbar by a Mexican blacksmith. He has found others built into stone walls, serving as doorstops and as weights on the lids of pickle, pork and sauerkraut barrels. Their owners are quite surprised when they learn that these handy little rocks have traveled to them through millions of miles of space. ★ ★ ★

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feet above the poles. Along the northern edge of the polar jet stream, there is usually an invisible atmospheric cliff in the troposphere falling off one or two miles like the land cliffs of the Grand Canyon. Dr. Namias and P. F. Clapp of the U.S. Weather Bureau advanced another explanation, namely that "the jet stream is due to the confluence of vast streams of [warm] equatorial air and [cold] polar air at great heights. When these warm and cold masses are brought side by side, the resulting pressure differences set up a strong circulation which may develop the strength of a jet." SELS Forecaster Don House says that the jet stream is "the result of kinetic energy, the transformation of energy of position to energy of motion."

Whatever their cause, the jet streams play havoc with the weather unexpectedly. But, as forecaster House says, "By watching the jet stream, with good analysis, we can pick out the three or four danger spots across the country where trouble might occur, in time to warn people and save life. Four years ago, our chances of spotting tornadoes before they occurred were 20 in 100. Now they have improved to 65 in 100. Severe storms may not always occur when and where we forecast them, but at least we know we should be on the alert." ★ ★ ★

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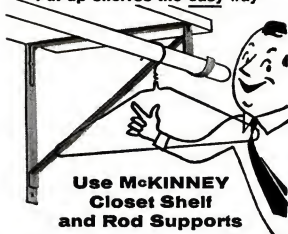
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"Too expensive to drive. Not enough miles per gallon. I get 10 miles per gallon in city."—New Jersey V8 owner.  
"Water leaks in trunk, around back window and doors. Floor mats wet."—North Carolina Marine.  
"It rides awful hard. Have had three sets of springs and it still rides worse than any car I've owned."—Ohio owner.  
"Very poor chrome. It pitted in less than two months."—Illinois railroad clerk.

"Paint not holding up."—North Carolina farmer.

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## More Complaints

"Turns hard when parking."—Ohio engineer.  
"On Powerglide, Reverse is between Neutral and Park. I think it should be below Low. When you start the car in Park you have to go through Reverse to get into Drive."—Illinois assembler.  
"Powerglide can be put into Reverse too easily. Should have a stop of some kind."—Illinois salesman.  
"If there is something wrong with a new car, you take it back to the dealer. They stall you around, ask you to leave it for a day. When you go to get it, they may have fixed it or may not even have touched it."—Ohio bakery supervisor.  
"All '58 Chevrolets except the Impala seem to have a high rear end. Why? Styling requires a graceful dip to the rear."—Florida television executive.  
"Oil pan leaks. Can't tell if I'm burning oil or just losing it."—Ohio merchant.  
"Brakes fade after several stops from high speed."—New York Army officer.  
"Gas tank leaked."—Illinois welder.  
"They placed all the controls, such as key switch, windshield-wiper switch, under the steering wheel. They are not handy at all."—North Carolina Marine.  
"Chevy should move the inside door handles farther toward the front of the car and higher. A tall man bumps the handle with his knee and the door comes open while the car's moving."—Illinois electrician.  
"Rear seat of the Impala hardtop won't sit three in comfort. The center armrest is not easy to sit on."—Illinois housewife.  
"I wanted the economy of the Six, but there's not enough power. I will sacrifice economy for an eight-cylinder engine with automatic transmission in my next car. It's too hard to keep up with traffic in this one."—Illinois salesman.

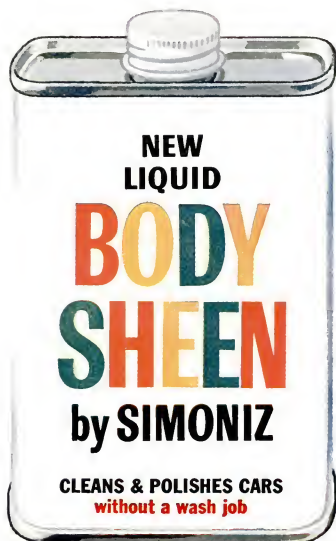
## What About Air Suspension?

A very small percentage of the Chevrolet owners have air suspension on their cars. Those who do, however, are not as enthusiastic about the device as you would expect. Here are some quotations:

(Continued to page 258)

**SIMONIZ MAKES IT**

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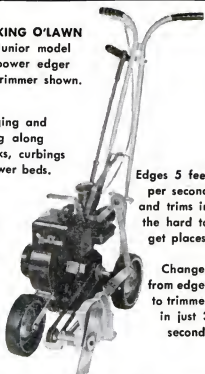
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Junior model  
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For edging and  
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sidewalks, curbsings  
and flower beds.

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California

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of power edger  
49 lbs.



Edges 5 feet  
per second and trims in  
the hard to get places.

Changes  
from edger  
to trimmer  
in just 3  
seconds

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Over 2000 Dealers to serve you. A few choice dealer territories are still available. Please write

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Chisels are used. They're tops:  
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**Delta POWER-KING ELECTRIC LANTERN**

APRIL 1958

247

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Old Craftsman's two seam-concealing joint patterns give genuine plank effect.

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## Explorer III Our Spy in Outer Space

(Continued from page 86)

The television camera is carried by the airborne spy and its output, a television signal, is relayed to a ground station. Picked up by sensitive antennas, the signal becomes a picture on a cathode ray tube (much like your own TV set's). A film is moved continuously across the tube's face, the film's rate-of-movement compensating for the spy craft's speed.

### Pictures in 20 Seconds

The system is called "Image Motion Compensation." Moving the film in synchronization with the aerial spy's own relative ground speed eliminates image blur. It's a nice trick, but basically no different than when you "compensate" for a fast-moving object by "following" it with your home movie or still camera.

The ground station cathode-ray receiving tube's flat face is coated with a special phosphor so that, unlike your own TV, only blue light in a very narrow spectrum is emitted. This narrow light band aims at maximizing response, thus wringing greatest detail from even a weak signal. As a matter of fact, for highest resolution a cathode-ray tube must operate at low intensity—its picture far less bright than would satisfy most home viewers.

Low light intensity produces a relatively faint image on the recording film, one reason why the developing-fixing solution (termed "monobath" because a single solution develops, stops and fixes) must be superfast. And it is. Highly acidic and warmed to about 120 degrees Fahrenheit, the monobath solution gets the entire job done in 10 seconds. Another 10 seconds and the film is squeegeed, air-dried and ready for viewing by intelligence officers.

Involved, as you might suspect, is some chemical sleight-of-hand. The monobath's developer chemicals do their job in the first two to three seconds, before the slower stopping-fixing chemicals have even begun to work. So there's no fogging.

### Electric Picture Erasers

"But film," explains one researcher, "will have only limited application in the spy-satellite camera. For once exposed and developed, the negative is dead weight and useless."

What will take over film's major recording job? Likely it will be RCA's radical new development called Electrofax. It employs a kind of electric blackboard which

(Continued on page 250)



The Dial-a-rain and Capri are available at leading hardware, garden supply and department stores or you may write direct to ...



**L. R. NELSON MFG. CO., INC.**  
PEORIA, ILLINOIS

## It's fun to sprinkle... with a Nelson **dial-a-rain**

Enjoy carefree sprinkling with a Dial-a-rain. Just set the dial to select the area, up to 43' x 51', to be covered with a beautiful, rainlike spray that soaks in instead of running off. Performance has been accurately measured to permit proper, controlled watering—and a handy chart tells you just how much to water.

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**America's Finest Cultivator**  
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complete



Now you can no longer afford to do hard spade and hoe work. This powerful (2½ h.p.) self-propelled tiller-cultivator makes gardening a pleasure! Has a beautiful self-propelled 22" twin-spindle rotary mower attachment you can hook on in second—for just \$44.50; and the Safe-Speed Edger for only \$27.50. Write today for free folder and nearest dealer's name.

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QUAKER STATE OIL REFINING CORPORATION, OIL CITY, PA.  
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can be wiped clean after each exposure and used over and over again.

The principle behind the Electrofax is what researchers tab the "photoconductive effect" which is another way of reciting an age-old electrical truism that like charges repel, while unlike charges attract.

Electrically charged, a sheet of paper coated with zinc oxide acts as a kind of permanent film, receiving the image picked up by the farsighted aerial camera. Formed is an invisible electrostatic "picture"—composed of positive, negative and neutral charges. Across this invisible picture is rolled an emulsionlike dye, its particles charged. The electrostatic picture's positive areas repel the dye's positive particles, while the negative charges attract the positive—physically forming the dye into a visible picture.

### TV in Reverse

Once this picture has been transmitted to ground or stored in memory devices, the visual image is erased electrically, and the "film" is ready for another electrostatic image.

Even more advanced is a television-reconnaissance system devised by Fairchild Camera and Instrument Corporation.

Stripped to essentials, Fairchild's television-spy system involves a powerful lens which, from miles high, surveys the terrain, focusing what it sees on the flat face of an image orthicon tube.

The image orthicon is a kind of TV receiving tube—in reverse. In your home set, a telecast signal energizes the coating on the receiving tube's face, creating a picture. In the orthicon the picture produces electrical impulses which can be stored and later transmitted to ground receivers. Result: A TV-clear picture of the terrain.

Explains a Fairchild researcher, "both the image orthicon and its less-sensitive electronic brother, the vidicon, change light into electrical current. What you get is an 'electrical picture'."

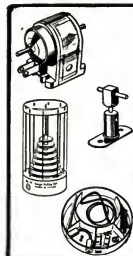
Feed the signal to a ground receiver's cathode-ray tube and the picture you see is what Explorer III saw minutes before, over enemy soil.

Here, however, interposes another problem: Ground-recording *all* that the satellite sees and transmits. Until recently there seemed no solution. The best earth-bound receivers and their cathode-ray tubes could record only about 500,000 bits of information at one time, although millions of bits could be transmitted every second. Ironically, it was a reversal of the image-transmission problem. There, you'll recall, the spy's film carried many more bits of

(Continued to page 266)



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Thousands of these tiny motors now in use on hobby, research and industrial devices. Tell us your needs or order from the list below for prompt delivery.

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Build-it-yourself 12" and 18" Bandsaws, 6" Belt Sander, Shaper. Simplified plans, build easily with hand tools only. Advertised and sold for 13 years, over 32,000 units in use. Money back guarantee. FREE CATALOG.

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MATERIALS



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Hatchet, belt axe and ball peen, too, in famous ROCKET design that has proved its worth in the hands of over 1,000,000 proud users. Ask a carpenter!

## TRUE TEMPER.

THE RIGHT TOOL FOR THE RIGHT JOB

# FORD

**Several Ford owners report serious engine failures like this.**

**He's talking about the new, extra-cost V8. Standard V8 is no mechanic's dream for servicing.**

**Right. Mirror is useless in rain or snow when you need it most. Real fault here, though, is with the wrap-around glass—one of the fictitious "advances" by the industry.**

**Other comments on PM's test car: Dash numerals easy to read in daylight, poor at night. But knobs well marked, day or night. Hard to get in, out of front seat due to windshield dogleg. Rear-floor topography judged poorest of three. Wells too small for comfort. Driver has a secure, detached feeling at high speed. Could be dangerous should he forget how fast the car can go (and probably is).**

low. With seat close up, you bump your knees."—Wisconsin stenographer.

"Somewhat cramped inside. Seats are too low and also too flimsy."—North Carolina farmer.

"Engine trouble. At 2020 miles the oil pump locked and burned out the main bearing, burned and cracked the block and burst three pistons. Ford replaced the engine at no cost to me."—Illinois foreman.

## More Best-Liked Features

"The solidness of the body is a big improvement over the 1957 I owned."—Illinois insurance adjuster.

"I belong to a car pool and there is plenty of room for six men."—Illinois machine operator.

"I sure like the retractable hardtop. But should have a separate key switch to operate it. Too many people play with top while it is parked in garage."—North Carolina salesman.

"The 1958 engine is a mechanic's dream. Everything is where it can be reached."—Georgia auto mechanic.

"Two weeks ago I had an accident with another make a lot heavier than Ford. My Ford took it a lot better than the heavier car. No one was injured as a result of the padded dash and safety locks. There were six in my car at the time."—Illinois painter.

"I think my Ranchero fills a need which hasn't been supplied in any other model. It rides and drives like a fine car yet has excellent light-hauling capacity. By removing the shelf back of the front seat and putting a couple of folding camp stools we can provide riding space for a couple of small youngsters."—Minnesota retailer.

## More Complaints

"Just yesterday the transmission went out on my new Ranchero. I have the new Cruise-A-Matic Drive."—Idaho salesman.

"Drafty. Leaks cold air."—Wisconsin contractor.

"Outside rear-view mirror on fender is in line of maximum distortion so is of little value, especially at night when double image of headlights is seen. Vent wing windows too small, too hard to open."—Illinois pilot.

"Need improvement on shocks. Hit bottom on hard bumps."—Georgia businessman.

"Do not like the way the upper tailgate closes on this station wagon. Would prefer a handle. You have to put your hands on the glass to close it and you get your gloves or hands dirty every time."—New York engineer.

"When the road is wet, water sprays on the windshield from the crack between the hood and the front fenders near the headlights. Very bad when road is muddy. After a mile or so you can hardly see out."—Wisconsin owner.

"Very poor on ice and wet pavement. Rear end slides. Will not pull."—Illinois carpenter.

## They, Too, Want Economy

Asked to make one suggestion to the auto industry, the Ford owners came up with a wealth of ideas. But, as in the other makes surveyed, economy is the most-wanted feature.

"Better gas mileage. You get me a car that will average 80 miles per gallon and I will pay \$1000 more for it."—Wisconsin assembler.

"Let the driver feel the road he's driving on. Less spongy cars."—New York musician.

"Specialize on safety. Design trend is fine. Please don't make them any smaller."—Texas serviceman.

"Exterior styling is becoming much too flashy."—Illinois Anglican priest.

★ ★ ★



**"You need special spark plugs, too"**

*Always use the spark plugs specially designed for outboards —*

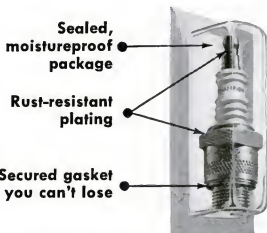
**CHAMPIONS!**

You need a *special* trailer for boats. And you need special spark plugs for your outboard — Champions.

New Champion marine spark plugs are protected by a sealed, moistureproof pack. The gasket is secured so it can't be lost. And the exposed metal surfaces of this new Champion are guarded by rust-resistant plating.

This new marine plug has Champion's special "J-gap" electrode design . . . needed for easy starts . . . smooth idle . . . and full power in outboard engines. This "J-gap" is one reason why *every* major outboard manufacturer uses Champions as original equipment.

Choose either the *new* marine Champions or the *regular* marine Champions. But always choose CHAMPIONS—the spark plugs specially designed for outboard motors.



CHAMPION SPARK PLUG COMPANY • TOLEDO 1, OHIO

**Every major outboard manufacturer approves — and uses** **CHAMPION** **Spark Plugs**

# PLYMOUTH

**A lack of will power that Detroit dearly loves.**

"Ours is a gas hog. Getting 11.5 miles per gallon in the city."—New Jersey V8 owner.

"Cars are too expensive. The markup is too high for an article that loses its value so fast. If I had will power I would run the car into the ground before buying a new one."—New York fireman.

"Seats are too low. Nothing to support your legs and they become tired on long trips."—Illinois airline pilot.

"Back of front seat presses into small of the driver's back."—Alabama Army officer.

"My complaints are with dealer, not with the car. I was charged for antifreeze, but didn't get it and the engine froze. Not enough to really hurt, but I'll never feel right about it. Whatever happened when the motor overheated has left a peculiar odor in the car, especially when motor warms up. It has spoiled the car for me."—Maryland businessman.

"Side-view mirror on left front fender is ridiculous because it is too far from the driver for quick, easy adjustment and it is virtually useless when you need it most in snow or rain."—New York teacher.

"Position of rear-view mirror is too close to the second-gear position in handshift model."—Illinois repairman.

"Back seat may be short of legroom with the front seat pushed back."—Arizona housewife.

"Very hard to get behind steering wheel. Knees keep hitting the wheel getting into the car."—New Jersey foreman.

"Car is built so low it is difficult to get in and out, even after several months' practice."—New Jersey secretary.

"When starting out, car jerks terrifically when Reverse or Drive button is pushed."—New Jersey owner.

"Still can't shift without looking at the buttons, especially into Reverse."—Florida photographer.

## More Good Points

"I like its easy and sure braking."—Illinois diemaker.

"Excellent trunk space. We go camping a good deal so I tried out the trunk to see if it would hold all the gear. In our old 1953 car we filled the trunk and an auto-top carrier as well. In the new Plymouth everything went into the trunk with room to spare. You may wonder why we don't have a station wagon. I dislike wagons. They are noisy and ride less comfortably. We can carry more in our trunk than a friend can in his wagon and have a comfortable ride besides."—Maryland mechanical engineer.

"Has heavy feel. Rides like it weighs 10 tons."—Arizona housewife.

"Dependable. Can take abuse. Plymouths are best for cabs."—Florida taxi owner.

"Heater on the Six works real fast."—New York student.

"I like the wind-down window in back of wagon instead of upper tailgate."—Florida painter.

## And More Complaints

"Door handles break too easily. They should be solid metal."—Maryland cab driver.

"Bubble window is definitely not a good point. No protection from sun and it takes on too many reflections."—Wisconsin mason.

"Should use better materials, especially in the trim."—Kansas secretary.

"It is 6 inches too wide and 12 to 24 inches too long, making it difficult in traffic and impossible to park in short spaces."—Virginia engineer.

(Continued to page 274)

**Absolutely right. Plymouth gets demerits on both its inside and outside mirrors.**

**Plymouth's rear seat most awkward to get in, out. Door doesn't seem to open wide enough.**

**No complaints about room in trunk of any car today. As cars get longer, trunks get bigger. You may have less headroom, but your bags have more.**

**Like the wrap-around, the bubble glass is of no practical value.**





**NEW!**



ADJUSTABLE WRENCHES

**PROTO'S**

**GOLDEN KNURL HOLDS  
EXACT JAW OPENINGS  
AUTOMATICALLY!**

**NO BUTTONS ... NO LEVERS ... NO GADGETS**

Available in FIVE popular sizes

**4", 6", 8", 10" & 12"**



2209 Santa Fe Avenue  
Los Angeles 54, California

ANOTHER REASON YOU'LL

**PREFER**

**PROTO**

**PROFESSIONAL  
TOOLS**

# New! . . . and available now! PROTO'S **CLIK-STOP** ADJUSTABLE

*. . . the amazing wrench with the Golden Knurl that holds exact jaw openings . . .*

## **AUTOMATICALLY**

**NO BUTTONS . . . NO LEVERS . . . NO GADGETS**

Colorful display makes it easy to select Click-Stop wrenches. No increase over regular prices. Now available in 4", 6", 8", 10", and 12" sizes. (16" and 20" sizes later) Look for them at your dealers.

The Click-Stop handles like an ordinary adjustable. Merely turning the Golden Knurl clicks jaw automatically into any opening wanted . . . even non-standard or foreign sizes. Won't work loose.

Drop-forged from fine Protoloy steel. Thin head design for hard-to-get-at jobs. Highly polished, chrome plated.



Adaptable for wall or counter



**Proved Rugged by Field and Laboratory Tests.** Professional mechanics across the nation job-tested the Proto Clik-Stop wrench. 98.1% acclaimed it a major improvement in adjustable wrench design.

In laboratory tests, the Golden Knurl was clicked through 1,969,640 positions with no appreciable wear. Try one yourself at your quality tool store.



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DIVISION OF TOOL INDUSTRIES

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## Western Pine Region woods . . . help you build big, spend little, look professional

Your own skill, a few tools, and a modestly priced supply of Western Pine Region woods are all you need to turn out a job like this.

The straight-grained Western Pine Region woods make home carpentry a pleasure. That's because these carefully dried woods work so easily, take any finish without losing their natural beauty.

Your lumber dealer can suggest a Western Pine Region wood for your furniture or remodeling job.

### FREE! "Friendly Home Ideas"

—85 photographs, many in color, feature traditional and contemporary ideas for building, decorating and remodeling with cheerful Western Pines. Write for your FREE copy to WESTERN PINE ASSOCIATION, Dept. 300-N, Yeon Bldg., Portland 4, Oregon.



### Western Pine Association

member mills manufacture these woods to high standards of seasoning, grading and measurement  
Idaho White Pine • Ponderosa Pine • Sugar Pine  
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Today's Western Pine Tree Farming Guarantees Lumber Tomorrow

NEW! *Evans*  
**POWER-TAPE**



### No More Pushing Blade Back Into Case!

Here's the greatest single mechanical advance in steel tape history! Press the button gently with your thumb — blade returns smoothly. You control the speed. Release the button—blade stops instantly. No "creep," no lost measurements! Chrome-plated case, GIANT sliding end hook — for inside-outside measuring. White steel blade, marked in inches and feet-and-inches—no figuring! Free Tenite carrying case with magnifying lens.

Only  
**\$1.89**  
(10 ft.)

**Unconditionally Guaranteed**  
6, 8, 10, or 12 ft. lengths  
Get POWER-TAPE today!

Available only at hardware stores

**Evans** RULE CO. Elizabeth, N. J.  
Montreal, Que.

## It's Easy To Repair

JEWELRY—CHINA—PLASTICS  
CERAMICS—KNICK-KNACKS  
POTTERY



### WITH TUFF-BOND QUICK-SET ADHESIVE

Keep a tube of this waterproof neoprene adhesive around the house to fix most anything. Easy to use. Sets quickly for strong, yet flexible bond. At better dealers everywhere. *Goodloe E. Moore, Incorporated, Danville 10, Ill.*



STICKS ALMOST ANYTHING TO ANYTHING

## CHEVROLET

*In a blindfold test, four riders were not certain which car had air bags, so minor is the difference.*

*Other comments on PM's test car: Extremely maneuverable, turn circle reduced sharply. Biggest of the three, it feels smallest due to nimbleness. Door operation excellent. Rear floor topography most comfortable. Rear seat easiest to get in, out. Test car had optional locking differential: Great on gravel roads. Dashboard-dial legibility excellent.*

"I have air suspension. I don't think it's worth the added cost because it's troublesome. Maybe it will be okay when it gets straightened out."—Florida owner.

"I am undecided right now as to whether this air suspension is worthwhile. I've had trouble and it has some good points, too."—Idaho teacher.

"Don't seem to get a smooth ride from air. I don't think it's worth the cost."—Illinois mechanic.

"Level-air feature highly undependable. Poor check valves and filtering system. Small road shocks not dampened out sufficiently."—Florida airline pilot.

### Public Wants Economy

When asked to make one suggestion to the industry, the Chevrolet owners (like other owners as well) want more economy. This seems to be the feeling of the entire public. Whether an economy car would sell in volume is a question, but the public insists it wants it.

"The industry should concentrate on producing a power plant which would significantly reduce the operating cost of cars."—Florida civil engineer.

"Improve economy of the automatic transmission. I may return to the standard-shift Six."—Wisconsin field man.

Other suggestions commonly made are:

"Slow down the assembly line just a bit so they could do a little better finishing work."—Wisconsin oil worker.

"More headroom. So a hat can be worn in the car."—Illinois professional baseball player.

"Build a small car, but dress it up so you will be proud to ride down the street in it."—Tennessee accountant.

"Bring back the trunk handle. Lid is hard to open and close with no grip on it."—Wisconsin owner. ★ ★ ★

## Faster, safer way to wash your car



Du Pont Car Wash gets your car so clean it drains dry, without *wiping*. Unlike ordinary detergents, it's safe for wax and it doesn't streak! At service stations and auto supply stores— $\frac{1}{2}$ -lb. can only 75¢.



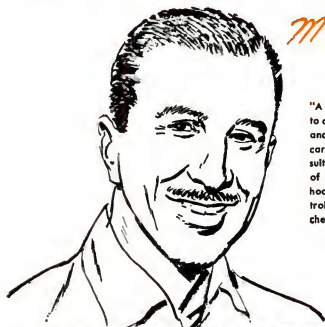
BETTER THINGS FOR BETTER LIVING  
... THROUGH CHEMISTRY



# DU PONT CAR WASH



# "There's more than one way to improve your gas mileage"

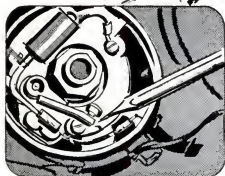


*Mauri Rose* —experimental test driver and automotive engineer.

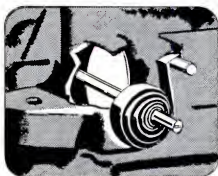
"A professional driver has a lot to do with getting top performance and economy from new cars he tests. But, the best results also depend on a number of intricate systems under the hood. That's why he relies on trained mechanics for needed checks and adjustments."



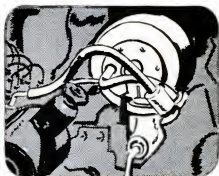
"Worn spark plugs could be a source of power and fuel loss. Electrodes must be clean, properly gapped and free from corrosion. New plugs of least every 10,000 miles is best."



"A pro always makes sure distributor points are clean and set of the proper distance for best performance. Arcing or cracks in the cap may develop to further decrease gas mileage."



"A trained mechanic checks the manifold heat control valve for possible trouble. A valve that's stuck open delays proper vaporization, a closed valve creates a loss of power."



"The vacuum system must be examined and connections tightened. Air filters should be cleaned. Clogged filters or air leaks upset mixture ratio and cause rough idle and fuel loss."



"Your carburetor should also receive a thorough check for any signs of needed adjustment, repair or cleaning. Proper care assures precision operation and maximum fuel economy."

*Specified as original equipment on more new cars than any other carburetor.*

Make sure you're taking advantage of the many ways to improve your gas mileage. See your Rochester Carburetor Specialist. He can properly diagnose your engine and make the necessary adjustments to give you the best possible performance and economy. And he's factory-trained to keep your precision-built Rochester Carburetor in top condition to deliver maximum mileage.



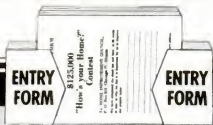
ROCHESTER PRODUCTS DIVISION OF  
GENERAL MOTORS, ROCHESTER, N. Y.

**POPULAR  
MECHANICS**  
MAGAZINE

Sponsored by leading manufacturers,  
dealers, contractors, builders, lending in-  
stitutions and Popular Mechanics Magazine

# Enter the \$125,000 Home Improvement CONTEST

NOTHING TO BUY—JUST FILL IN THE ENTRY FORM!



## A Sign, A Symbol, An Entry Form ... Guideposts to \$125,000

Prizes totaling \$125,000 are the incentive for the Home Improvement Council's "How's Your Home" contest. There's nothing to buy—just fill in the entry form available at any dealer displaying the Popular Mechanics' sign or HIC emblem, or use the coupon provided. The Home Improvement Council is a non-profit organization of manufacturers,

dealers, contractors, builders and lending institutions, and is subscribed to by Popular Mechanics. Its purpose is to help you **BETTER YOUR LIVING** through planned improvement projects from redecorating to complete home remodeling. Your local member stands ready to help you—ask him for information and assistance.



Check this list, and others in May and June, for the name of your local Home Improvement Dealer featuring Popular Mechanics Window Displays. He'll have information and entry forms for the \$125,000 contest

#### CALIFORNIA

Abernethy  
Martenets Hdw.  
Nadorff Hdw.  
Acaedia  
Bols Hdw.  
Hage Hdw.  
Arlington  
Arlington Hdw.  
La Sierra Hdw.  
Azusa  
Celtis Hdw.  
Baldwin Park  
Baldwin Park Hdw.  
Banning  
Banning Hdw.  
Bellflower  
Chambers Hdw. & Bldg.  
Bell Gardens  
Eastern Hdw.  
Biff  
Allied Hdw.  
Brea  
Brea Hdw.  
Buena Park  
Buena Park Hdw.  
Bouthland Hdw.  
Canoga Park  
Wayne-Davis Hdw.  
Chatsworth  
Chatsworth Lbr. Co.  
Chino  
Center Hdw.  
Herbs Hdw.  
Chula Vista  
Peters Home & Garden  
Center  
Compton  
Compton Hdw.  
Thompson Hdw.  
Costa Mesa  
Carney Hdw.  
Nelsons Hdw.  
Covina  
Covina Hdw.  
Culver City  
Belman's Hdw.  
Steller & Storg  
Downey  
Wenney Lumber  
Fontana  
Harris Bros.  
National Hdw. & Bldg.  
Sup.  
Fullerton  
Lowen Hdw.  
Fullerton Hdw.  
Gardena  
Gardena Hdw.  
Garden Grove  
Garden Grove Hdw.  
Hawthorne  
Schlimmer's Hdw.  
Hermosa Beach  
Hughes Hdw.  
Reynolds Hdw.  
Hollywood  
Smith Hdw. Co.  
Huntington Beach  
Jones Hdw.  
Torat's Hdw.  
Huntington Park  
James Hdw.  
Indio  
Imperial Hdw.  
Inglewood  
Baliann Hdw.  
Brizolara Hdw.  
Van Tines Hdw.  
La Canada  
La Canada Hdw.  
La Habra  
La Habra Hdw.  
La Puente  
Fred Lund Hdw.  
Lawndale  
Cook Lbr. Co.  
Long Beach  
Bayshore Hdw.  
Circle Hdw.  
Evans Hdw.  
Howard's Hdw.  
Norwalk Hdw.  
Raber Hdw.  
Wardlow Hdw.  
Los Angeles  
Ayres Hdw.  
Callahan Hdw.  
Cherry Co., Inc.  
Clifford's Hdw.  
Gerald's Hdw.

Koontz Hdw.  
Paulus Hdw.  
Tritch Hdw.  
Lynwood  
Abco Hdw.  
Maywood  
Canning's Hdw.  
Monrovia  
Bunker's Hdw.  
Newport Beach  
Bay Hdw.  
Northridge  
Handy Hdw.  
North Hollywood  
Whitsett Hdw.  
Norwalk  
Harold's Hdw.  
Morres Hdw.  
Ontario  
Adams Hdw.  
Orange  
Camp Hdw.  
Orange Hdw.  
Paramount  
Paramount Hdw.  
Pasadena  
Colorado Hdw.  
Piedley  
Piedley Hdw.  
Pomona  
Huntington Hdw.  
Westmont Hdw.  
Redlands  
Bates-Carlson  
Redondo Beach  
Anza Hdw.  
Pickins Hdw.  
Renda  
Whitire Hdw.  
Rialto  
Johnson & Son  
Rubidoux  
Rubidoux Hdw.  
San Bernardino  
Bud's Hdw.  
Lumbattis Hdw.  
Sierra Hdw.  
San Diego  
A. A. Hdw.  
Bakers Hdw.  
San Fernando  
Empire Hdw.  
San Gabriel  
Anderson & Hammerlind  
Inc.  
Smith Hdw.  
Village Hdw.  
San Marino  
San Marino Hdw.  
San Pedro  
Kormak Hdw.  
Santa Ana  
Griffin Hdw.  
Knox Hdw.  
Washington Hdw.  
Sherman Oaks  
Sherman Oaks Hdw.  
Sierra Madre  
Sierra Madre Hdw.  
South Gate  
A.B.C. Hdw.  
Stanton  
Chambers Hdw.  
Temple  
Heale Hdw.  
Torrence  
Handyman Hdw.  
Las Palms  
Torrence Hdw.  
Tustin  
Poothille Hdw.  
Tustin Hdw.  
Van Nuys  
John's Hdw.  
Vista  
Jones Hdw.  
Westminster  
Chets Paint & Hdw.  
Westminster Hdw.  
Whittier  
Coffman Hdw.  
Kleta's Hdw.  
Wilmington  
Wilmington Hdw.  
Yorba Linda  
Yorba Linda Hdw.  
CONNECTICUT  
Bristol  
Bristol Store  
City Hdw.  
Lee Hdw.

Canaan  
C. A. Lindell & Son  
Collinsville  
Eaton Hdw. Co.  
Danbury  
Heyman Hdw.  
Danielson  
D. Blumenthal  
East Hartford  
Main Hdw.  
Superior Hdw.  
Elmwood  
Elmwood Hdw. & Sup.  
Granby  
Beman Hdw.  
Hartford  
Capitol Hdw.  
Euclid Hdw.  
Hurwitz Hdw.  
Hartwinton  
Hartwinton Hdw.  
Manchester  
W. G. Glenney Co.  
Mooseup  
Salisbury's Hdw.  
New Milford  
Village Hdw.  
Putnam  
Trudeau & Roy Inc.  
Rockville  
Liebe's Hdw. & Paint  
Simsbury  
Welden's Hdw.  
Southington  
Neal's Hdw.  
Stafford Springs  
Marty's Hdw.  
Stafford Hdw.  
Storrs  
Mansfield Sup.  
Terryville  
Terryville Hdw.  
Thomaston  
Shearer's Hdw.  
Torrington  
Burritts Hdw.  
Unionville  
Parson Hdw.  
Washington Depot  
Washington Sup. Co.  
Watertown  
Kay's Hdw.  
West Hartford  
Anderson & Hammerlind  
Inc.  
Oakwood Hdw.  
Williamantic  
Morris Hdw. & Sup. Co.  
Windsor Locks  
F. S. Bidwell Co.  
Windsor  
Highland Hdw.  
Park Place Hdw.  
Woodbury  
F. F. Hitchcock Co.  
DELAWARE  
Clayton  
Slaughter's Hdw.  
Delmar  
Daniell Hdw.  
Dover  
Dover Hdw. Co.  
Frederica  
Wilson & Gerow Hdw.  
Georgetown  
H. W. Purnell & Co.  
Greenwood  
Meredith Hdw.  
Harrington  
Taylor's Hdw.  
Laurel  
Laurel Home & Auto Store  
Taylor Hdw.  
Middletown  
Buckworth's Hdw.  
Milford  
Rimes Hdw.  
Millsboro  
Boulevard Hdw. Co.  
Millville  
Millville Hdw.  
Newark  
Jackson Hdw.  
Newark Lbr.  
Rehoboth Beach  
Rehoboth Hdw.  
Seaford  
Sussex Hdw.

Wilmington  
Avenue Hdw.  
Thomas Cardwell Co.  
Highpoint Hdw.

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Dania  
Griffey Hdw.  
Fort Lauderdale  
McCann Hdw. Co.  
Hollywood  
Harry-James Hdw.  
Hardware Inc.  
Shopper's Hdw.  
Miami  
Cutler Ridge Hdw.  
Miami Shores  
National Hdw.  
N. Miami  
Nails & Pails Hdw.  
Smitty's Hdw.  
N. Miami Beach  
Dell Padley's Hdw.  
Pompano Beach  
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#### ILLINOIS

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Antioch Lbr. Co.  
Argo  
Altovec Hdw.  
Arlington Heights  
Ace Hdw.  
Bowen Hdw.  
Freitas Hdw.  
Aurora  
Ace Hdw.  
Kelley's Hdw.  
Barrington  
Ace Hdw.  
Batavia  
Swanson Hdw.  
Belvidere  
Brooks Heating & Hdw.  
Bensenville  
Laho's Hdw.  
Blue Island  
Schreiber Bros. Hdw.  
Broadview  
Broadview Hdw.  
West Suburban Hdw. & Sup.  
Byron  
S. F. Piper & Sons  
Carpenterville  
Western Hdw. & Sup.  
Cary  
Serres Hdw.  
Chicago  
Ace Hdw., Belmont St.  
Ace Hdw., Broadway  
Ace Hdw., N. Harlem  
Ace Hdw., W. North Ave.  
Arlington Hdw.  
Arnoff Hdw.  
Barnes Paint & Hdw.  
Bryn Mawr Oak & Hdw.  
Calumet Hdw.  
Carl's Hdw.  
Clark-Devon Hdw.  
Eden Best Hdw.  
Hanks Hdw.  
Hoffman Hdw.  
Jefferson Park Hdw.  
King Hdw.  
Lundins Ace Hdw.  
Paulus Hdw.  
Recks Hdw.  
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Schultz Hdw.  
Steve's Hdw.  
Sundberg Hdw.  
Vanderborn Ace Hdw.  
Wilson Hdw.  
Chicago Heights  
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Cicero  
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Deerfield  
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De Kalb  
Gustafson & Steele  
Des Plaines  
Golf Quality Hdw.  
Dixon  
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 Soukup Hdw.  
 Elgin  
 Ace Hdw.  
 Elmhurst  
 Soukup Hdw.  
 El Paso  
 Burton Bally Hdw.  
 Evanston  
 Ace Hdw.  
 Lemol Hdw.  
 Evergreen Park  
 Boyd Hdw.  
 Forest Park  
 Peaslee Hdw.  
 Fox Lake  
 Ace Hdw.  
 Fox River Grove  
 Leland Hdw.  
 Franklin Park  
 Killinger Ace Hdw.  
 Geneseo  
 Ace Hdw.  
 Geneva  
 Ace Hdw.  
 Geneva Hdw.  
 Glenn Ellyn  
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 Glenview  
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 Harvard  
 Coast to Coast Hdw.  
 Harvey  
 Sibley Lumber Co.  
 Highwood  
 Sherony Hdw.  
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 Itasca  
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 La Grange  
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 Lake Zurich  
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 Gus Bock Hdw.  
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 Lockport  
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 Marengo  
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 Markham  
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 Maywood  
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 Morrison  
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 Oak Lawn  
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 Oak Park  
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 Oregon  
 Gilbert Hdw.  
 Ottawa  
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 Peoria  
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 Sycamore Hdw. Co.  
 Tampico  
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 Easton  
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 Greensboro  
 James T. Butler Hdw.  
 Hillsboro  
 Hillsboro Hdw.  
 Northeast  
 Homeowners Sup. Co.  
 Ocean City  
 Byrd's Hdw.  
 Perryville  
 Perryville Sup. Co.  
 Pocomoke City  
 Lankford & Cutler  
 Port Deposit  
 Bond Hdw.  
 Princess Anne  
 Warwick's Store  
 Rising Sun  
 Rising Sun Hdw.  
 Rock Hall  
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 Snow Hill  
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 Seekonk  
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 South Dartmouth  
 Bliss Corner Hdw.  
 W. R. Kins Lbr. Co.  
 P. S. Manchester Sons  
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 Spencer  
 W. E. Aubuchon Co., Inc.  
 Springfield Hdw.  
 Belmont Hdw.  
 Stockbridge  
 W. J. Buckler Hdw.  
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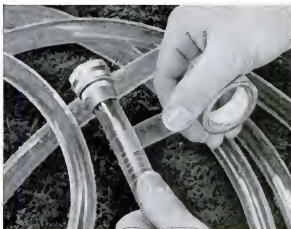


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intelligence than could be telemetered to ground. Here, it was the cathode-ray tube's inability to receive even this limited amount of transmission.

Happily, solution is at hand. A complex device called an ultrasonic light modulator acts like a battery of cathode-ray tubes and converts the transmitted signal into a light image. The image then exposes a film that contains every dab of transmitted image.

## Radio Signals Make Photos

The same modulator, moreover, can convert the orthicon's electrical image into a light image, exposing film in the satellite. Automatically developed, the film is stored. Later, when the spy satellite is ready to discharge its intelligence, a scanning device reconverts the filmed image into electrical impulses—which are transmitted to the ground.

Basically, the ultrasonic cell consists of a piezoelectric crystal in contact with a container filled with alcohol and water. A piezoelectric crystal has the property of expanding or contracting when an electrical potential is applied across it. Fed the signal from Explorer III's transmitter, the crystal vibrates. These vibrations set up corresponding vibrations, or pressure waves, in the liquid. Now, if the liquid is bathed in a light source, the pressure waves—exactly duplicating the amplitude and frequency of the electrical image—will interrupt the light. This will produce a visual image identical to that picked up by the satellite. Recorded on film for analysis by military experts, the image may not mirror every detail seen by Explorer III. But at least—thanks to ultrasonic light modulation—it contains everything *transmitted*.

## Radar Has Drawbacks

Probably about now you're saying, "seems pretty complex." And it is. Even more complex will be Pied Piper's radar eyes.

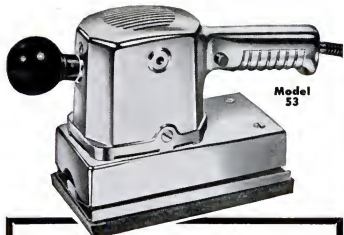
Visually, radar trails a poor third compared either to television or aerial photography. Radar's special advantage, of course, is its ability to reach through miles of atmosphere—to "see" when clouds blind television and aerial cameras.

For greatest effectiveness, radar's beam must be focused—by parabolic antennas. So its vision is restricted to a smaller hunk of terrain.

One researcher has estimated radar's vision as "about 30,000 feet from 240 miles." That is, a target would have to measure nearly six miles to be clearly imaged by a radar orbiting at 240 miles. And perception would be less at four times the altitude.

(Continued to page 268)





Model  
53

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Says one scientist, "For really good results you'd need a 50-foot antenna and we're a long way from a satellite that large."

Of course, umbrellalike antennas, spring-tensioned to unfold when Explorer III wrenches free of the atmosphere, would add more weight than Explorer III, already crammed with other sensing and seeing devices, could afford.

### Plenty of Power Needed

Even so, radar could probably pinpoint lakes, some rivers, coastlines, general terrain, weather and our largest cities. Smaller towns might show as definable blurs.

All these—aerial cameras, radar, storage devices, timers and transmitters—require power. Where's it coming from? The answer: From the sun. Unless, of course, a really pint-sized, lightweight nuclear reactor is devised before Pied Piper's scheduled launching.

Pied Piper's spherical outer skin will likely be a mosaic of glasslike, wafer-thin silicon solar cells. A square meter of what researchers call "choice cells" (hand-picked for efficiency) would, each hour, wring from the sun some 140 watts of storable energy.

"Actually," points out Norman Regnier, chief of solar equipment design, Hoffman Electronics Corporation (which supplied Vanguard's solar cells), "we're counting on 150, even 160 watts per hour there in space where, unattenuated by air and atmosphere, sunlight is far more intense."

Even so, to charge its batteries to operational levels, Pied Piper might have to take a spy's holiday—every 24 hours or so.

### Sunny Side Recharge

That is, with its timing device set to operate only when enough solar energy had been collected, Pied Piper would cease to spy while it orbited in quest of energy. Twelve of any given celestial 24 hours would likely produce 1200 to 1800 watts of power. This relatively slow recharge is easily explained; during half of its globe-girdling, Pied Piper will be in the earth's shadow. And at other times only about half of the cells will be in sunlight.

However, Pied Piper might scrupulously conserve its power, expend it only briefly over enemy territory and briefly again, over friendly terrain.

Short of low-level aerial reconnaissance (by plane or missile), spatial spies should prove our best intelligence agents, their electronic eyes focused on airfield and factory. And perhaps, on your own back yard. ★ ★ ★

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**2-SPEED, 2-DIRECTION  
OPERATION TO SAVE  
TIME AND MONEY!**

**ARIENS DE LUXE  
MULTIMATIC  
ROTARY TILLER**



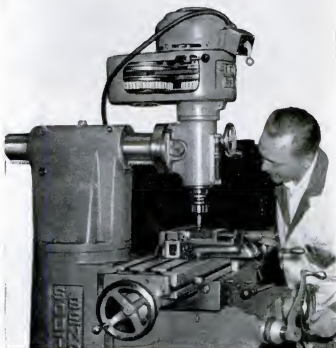
Reversible handle and Insta-Hitch attach-  
ments make this 16-inch tiller the most  
versatile, easiest operating, best balanced  
tiller model Kohler 3.6 h.p. engine. Save  
time—save work with Ariens Multimatic!  
Write for folder. Dealer inquiries invited.

*Ariens*

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## SOUTH BEND Vertical Spindle Milling Machine



- Mills—bores—drills—reams at any angle. Head rotates 360° vertically.
- Easy accessibility simplifies job set-ups and tooling changes.
- Fast—positive head indexing and table positioning. Easy-to-read dials.
- Rugged, heavy ribbed column, knee and table.
- 32" or 42" table with 20" or 30" travel.
- Prices start at \$1829 f.o.b. factory.



**In or Out Ram Travel  
Without Re-setting  
Head Angle**

Head swivels on ram  
flange. Ram has a large key  
sliding in a keyway with  
an adjustable tapered gib.  
No side play or canting  
when ram is moved—al-  
ways in alignment.

**WRITE** for complete information on milling  
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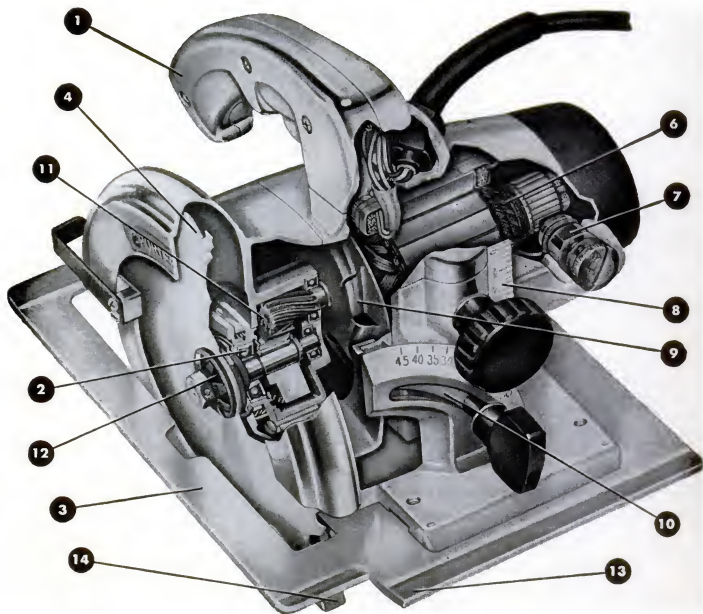
**SOUTH BEND LATHE**  
**SOUTH BEND 22, INDIANA**

Building Better Tools Since 1906



Up to 24  
months to pay.

# PORTER-CABLE



**1 BALANCE**—Comfortable, contoured handle is specially designed and located for easy one-hand operation and for operator comfort on every cut... in any position!

**2 PRECISION BALL BEARINGS**—Heavy-duty, oversize ball bearings are used THROUGHOUT; grease packed at factory for lifetime trouble-free service.

**3 WIDE 'WRAP-AROUND' BASE**—Heavy-duty machined base projects on both sides of blade to provide full support and greater stability on cuts from either direction.

**4 CHROME-PLATED BLADE**—Chrome plating gives blade extra-hard

cutting edge for longer life. Standard equipment on all new models.

**5 GEAR LUBRICATOR**—Keeps gear chamber well lubricated without having to dismantle saw. Simple twist of cup ring injects grease onto gear and pinion. (Not shown on drawing.)

**6 PRECISION MACHINE-WOUND ARMATURE**—Features a newly-developed winding technique which assures identical electrical and physical characteristics of the coils. Coils are nylon-clad and insulated for maximum power and top performance.

**7 HEAVY-DUTY BRUSHES AND BRUSH MECHANISM**—Spring-loaded cer-

tride type brushes are self-adjusting. Specially designed for better commutation and peak performance.

**8 CALIBRATED DEPTH SCALE**—Eliminates guesswork. Simply loosen depth adjustment knob and instantly raise or lower saw to desired depth as indicated on the scale.

**9 DUST BLOWER**—Specially designed to maintain high efficiency of motor and keep cutting line clear.

**10 PRECISION ANGLE SEGMENT**—Quick and easy to set for accurate bevel cutting from 0° to 45°. Weight of saw is held by heavy die castings at any depth or angle setting.

**11 PRECISION MACHINED GEARS**—Hardened for greater tooth strength, larger contact area, peak performance and longer life.

**12 KICKPROOF CLUTCH**—Eliminates kickback. Protects operator. Prevents motor and switch burnout.

**13 SINGLE LINE OF CUT**—Only one sighting line to follow on any cut—whether straight, angle or bevel.

**14 SAFETY 'NO-DRAW' GUARD**—Patented interlock on leading edge prevents jamming at start of any cut, and eliminates "drag" during the cut. Positive action of new coil spring returns guard immediately after cut is completed.



# SAWS

## are the world's finest...

**HERE'S WHY:** When it comes to designing a better saw — you can depend on Porter-Cable to do it — and do it first! Typical of Porter-Cable's fifty years of leadership are these three models — the newest additions to the famous line of Porter-Cable saws. Today, more than ever, it pays to see these quality saws at your Porter-Cable dealer. You'll get more cutting power... more satisfactory use... more professional features... more lasting value... at special low introductory prices!



### LIGHTWEIGHT 6 1/2" SAW

A 6 1/2" lightweight saw with full professional construction. 10-amp. motor for rugged cutting jobs. Perfect for all framing and roughing cuts.

**Model 146A \$69.50**

146A Saw, in handy Builder Kit, with rip guide for fast, accurate ripping and steel carrying case. **Model 146Ak Saw Kit \$83.50**



### RUGGED 7" SAW

A rugged 7" all-purpose saw with a full 12-amp. motor to give you power and speed usually found only in higher priced saws. Provides trouble-free, dependable service on every type of cutting job. **Model 115A \$79.50**

115A Saw, in handy Builder Kit, with rip guide for fast, accurate ripping and steel carrying case. **Model 115Ak Saw Kit \$93.50**



### HEAVY-DUTY 8 1/4" SAW

A low-priced, heavy-duty 8 1/4" saw with rugged 13-amp. motor. Designed especially for the builder who wants added power with big cutting capacity. Safety features include auxiliary front blade guard. **Model 168 \$99.50**

168 Saw, in handy Builder Kit, with rip guide for fast, accurate ripping and steel carrying case. **Model 168K Saw Kit \$113.50**



**PATENTED DESIGN** of telescoping guard eliminates jamming and "drag" during any cut, even compound miter.



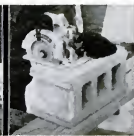
**HANDY GEAR LUBRICATOR** keeps gear and pinion well lubricated without having to take saw apart.



**EASY TO HANDLE** on any cut — because of light weight and balance. Ideal for cut-off and trimming operations.



**EXCLUSIVE** auxiliary front blade guard, on Model 168 only, covers saw teeth even on shallow cuts.



**ABRASIVE BLADES** are available for cutting metal, stone, masonry, plastics and other problem materials.

**Porter-Cable**  
*Quality Power Tools*

**SAWS • BELT SANDERS • FINISHING SANDERS  
DRILLS • ROUTERS • PLANES**

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Canadian prices slightly higher.

**SEE YOUR DEALER — OR MAIL COUPON TODAY!**

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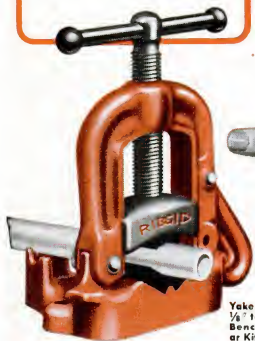
Please send me complete information on your new Saws and name of my nearest dealer.

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Address

City  Zone  State

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Just a  
Pipe Vise**



Yoke or Chain Vises  
1/4" to 6" capacities  
Bench, Stand, Post  
or Kit

## **RIDGID Pipe Vises**

**...give you most  
utility for your money**

**RIDGID** LonGrip jaws take a firmer grip on pipe—and without chewing it up. Most of these vises have handy work-tray bases, pipe rests and pipe benders, doing more for you than merely holding pipe. It pays you to ask for **RIDGID** at your Hardware Dealers.

The Ridge Tool Company • Elyria, Ohio, U. S. A.



### **All-Transistor Metal Detector Uses 1500-Hour Batteries**

Now available for prospectors is an all-transistor metal detector that weighs only 12 pounds. It's powered by batteries which have an estimated life of 1500 hours of continuous operation. The detector also features printed circuits, single-turn aluminum detecting loops and a glass-fiber case. The unit is designed to detect all metals and conductive minerals.

### **Boats Made of Rubber-Plastic Will Be Unsinkable**

Small boats will soon be made of a tough blend of rubber and plastic called Royalite. With a five-ply construction built around a cellular center, its advantages include an impact strength three to five times greater than all other boat materials, and an imperviousness to rot, rust, worms or corrosion. Because of the material's cellular construction, a boat made from it cannot sink when swamped.

### **Instant Bread**

Scientists at Florida State University report they have developed a bread that can be stored dry for several months yet looks and feels like fresh bread when moisture is added. However, the experimental bread is "short on taste." The goal is a dehydrated bread that can be stored for several years and still taste like fresh bread when its normal water content is restored.

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4 Bits—  
24 Combinations

**\$1.70**

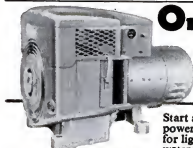
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500 to 10,000 watts. Supply plug-in power anywhere!

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## NEW HONEYWELL DECORATOR LIGHT SWITCH!



Change it  
any way,  
any time



to match  
your room's  
decor!



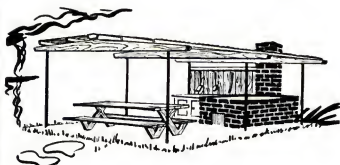
**T**HE TRANSPARENT decorator plate on the new Honeywell TAP-LITE\* snaps off for easy decorating, cleans easily. Just wipe with a damp cloth. Simple to install. TAP-LITE has screwless terminals. Easy to operate. Tap, it's on. Tap, it's off! Switch and plate \$1.95 at hardware stores.

**Honeywell**



First in Controls

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Outdoor living can be gracious and convenient with this modern adaptation of an old Southern idea. Build it for your own use or for profit, using Corrugulux—the shatterproof translucent panel that reduces glare, adds colorful beauty.

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Non-inflammable paint remover

Fast • Clean • Safe

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## PLYMOUTH

*A fault of all three cars. What happened to that wonderful under-the-seat heater, the industry's gift to rear-seat passengers?*

*Other comments on PM's test car: Windshield reflections bad at night. Dash dials excellent, day or night. Rotary headlight switch is too easy to leave on when parking on a foggy morning. Pull-out switch is more obvious, tells you it's on. Base of front-seat back had uncomfortable ridge that bothered driver. Doors hardest to operate. Glove compartment inconvenient. Wonderful (best of the three) car to drive, due to precise power steering with its fast steering ratio.*

"Can't find a garage big enough for my station wagon. After all, 214 inches is long."—New Jersey businessman.

"Paint too thin. Base coat shows through in spots."—Virginia government employee.

"Poor circulation from heater beyond front seat."—Wisconsin social worker.

"Should have handle on trunk. Always leave fingerprints where trunk is pushed down."—Wisconsin owner.

"Dimmer button hard to reach for short person."—Wisconsin design engineer.

"Location of glove compartment is inconvenient. It's far to the right and the contents fall out when it is opened."—Washington, D.C., retired Naval officer.

In each survey we ask the owners to make one suggestion to the industry as a whole, not just to the company making their car. Here are some of the most interesting suggestions:

"I believe the modern low-price American car has about reached the optimum size in relation to riding comfort. The small foreign cars which operate more economically do so with a sacrifice in comfort. I prefer the somewhat more expensive comfort. My principal gripe is directed at shoddy workmanship."—Maryland physical chemist.

"If your survey helps to restore normalcy in length of cars, reduction in claptap, a better placement of mirrors and a correction of the fish-bowl glass arrangement which permits the sun to pour in on the helpless driver, I shall be grateful."—New York assistant principal.

"They should make a car where the driver sits a few inches ahead of other passengers, also a few inches higher. At least give the driver's seat the most consideration."—Colorado stationary engineer. ★ ★ ★

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THE MOST REVOLUTIONARY ADVANCE  
IN PELLET GUN SHOOTING IN A DECADE!

## Crosman

.22 CALIBER PELLGUN RIFLE

# "400" REPEATER

featuring

Exclusive Patented SWING-FEED® LOADING  
with Load Indicator, and TRU-FLYTE® BARREL

Another first by Crosman—a Repeater Rifle! No more manual loading. Crosman SWING-FEED LOADING feeds and loads ten pells automatically as you slide the bolt! Crosman Load Indicator pops out to show when chamber is loaded. Absolutely trouble-free. TRU-FLYTE Barrel delivers amazing new accuracy in pellet shooting. WRITE for colorful, new shooting booklet, Crosman Arms Co., Dept. PM-16, Fairport, New York.

NOW STOCKED BY CROSMAN SELECT DEALERS

Shooting is 3 Times MORE FUN with

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Power  
Without Powder®

## PELLGUNS®

Available in Canada

World's Largest Manufacturer of Pellet Rifles and Pistols

POPULAR MECHANICS





**Good  
Craftsmanship  
starts with a**

# COLUMBIAN VISE



You can't really do any job well without a dependable vise. COLUMBIAN D43½ Workshop Vise is guaranteed by the world's largest vise builder. Channel steel beam, cold-rolled steel screw, replaceable heat-treated steel jaw faces, permanent pipe jaws... many more features.

Jaw Width... 3½ in. Pipe Capacity... ½-1¼ in.  
Jaw Opening... 4 in. Weight... 16 lbs.

Vises are also available with 4-inch jaws (D44) and 5-inch jaws (D45). See Your Dealer.  
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\*add \$1 west of Rockies.

**\$11.90\***  
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**COLUMBIAN VISE & MFG. CO.**

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WORKSHOP TOOLS  
SAFE AND ORDERLY**



This 7-drawer machinist's chest has a place for every tool. Extra durable heavy gauge steel. Felt lined drawers protect delicate edges... operate easily. Size: 8½" x 13½" x 20¼". \$27.95 at leading hardware stores. Slightly higher west. Other home workshop models from \$1.25 up.

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**NOW 4 FOR \$1.00**

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200 Ampere  
"HUSKY BOY"



AC Transformer  
Shop Type Welder



AC Welder  
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Combination

Every day more and more opportunities for big profits arise in arc welding. Why not cash in, especially when it's so easy to do—with a low cost, high efficiency Hobart welder. Any one of these easy-to-use models puts you in business immediately.

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AC TRANSFORMER is a popular model for small shops, auto service shops, plumbing and heating contractors, farm welding, etc. Economical to operate, yet has big industrial model features.

AC WELDER/AC POWER 200 amp. combination furnishes current for welding and power for running tools, lights, etc. Simply connect it to your own power source or to portable gas engine. WELDING LESSONS BOOK, 200 pages, fully illustrated. Self teaching, \$1.00.

**HOBART BROS. CO., BOX M-48, TROY, OHIO, FE 2-1223**  
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Save \$200 to \$300 using this Hobart DC Welding Generator that gives you the opportunity to build your own efficient portable gasoline driven arc welder, at low cost.

These generators come equipped with all the features that are standard with Hobart factory-built engine driven models. Write for free booklet—*"How To Build Your Own Arc Welder"*

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16 oz. head

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## "3 in One" UNBREAKABLE Hammer

**Forged One-Piece** head-handle  
Strongest Construction Known

**Everlasting Cushion Grip**  
Lasts for Life of Head

**Whip** that Gives Smooth, Effective Drive  
Marks You As a Master Craftsman

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## HUOT ROLLING TOOL CHEST

PROTECTS YOUR VALUABLE TOOLS

Goes where your work is! It's a handsome professional piece of equipment!

This complete rolling cabinet is ruggedly built of heavy formed and welded steel for permanent service on the job or in your home workshop. Three top drawers are cork-lined for precision tools—two heavy duty bottom drawers are extra deep for power tools. Complete with built-in lock.

MODEL 250

**HUOT** Rhymes With Do-It!

Write for free bulletin showing this and 12 other models!  
HUOT MFG. CO., 555 N. Wheeler St., St. Paul 4, Minn.



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Made of sheet steel with a continuous hinge on one edge, a door opening to electrical wiring in the ceiling can be concealed by a matching tile. The face of the door is cupped so that a tile will fit into it. The door catch is on the topside and only the hinge barrel is visible when the door is closed. It's opened by inserting a screwdriver into a hole in the tile.



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More fun on the water, less work out of water—that's the Cadillac story for '58. Plenty of room for friends and fishing gear. Light but mighty seaworthy. The

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**GIGANTIC  
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- 1½" inlet, capacity to 140 gals. per min. Pressure to 70 ft. Speed 3000-3600 rpm. Complete with pulley. Diam. 7"x9"x3". Wt. 18 lbs. List price \$62. SALE, **\$21.95 FOB**
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For painting, cleaning, tire, control terminals. Assemble your own outfit and save money. Lowest prices in U. S.

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• Variable hydraulic speed reducer. Any speed from 50 to 750 rpm by simply changing gears. Handle up to 1½ h.p. Use for midsize cars, shop hand saws, etc. Instant reverse. Govt. cost \$400. **SPECIAL \$47.81 FOB**

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• Brand new Blackhawk hand hydraulic pump. Complete with oil reservoir control valve, built-in relief valve. Pressures to 500 lbs. Use for wagon unloader, lift truck, shop press, etc. Govt. cost \$100. **SALE.....\$23.95 FOB**

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• Marvellous buys in new condition. Govt. and factory surplus plants and generators. Write for catalog.

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• Use golf or boys electric car. Geared 140 to 1. Run 6 or 12 volt auto storage battery. Easily reversible. Full instr. Wt. 34 lbs. Govt. cost \$250. ....**\$18.95 FOB**

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Instantly gives information on lumber, nails, concrete mixes, painting materials, etc. Convenient, simple to read. Just set dial for nail specifications, to convert linear to board feet, find bit sizes for screws, compare characteristics of woods. 6" diameter heavily varnished cardboard. Send 25c, no stamps, please to Greenleaf Tool Co., 2104 Columbia Avenue, Rockford, Illinois.

### WELD SOLDER

### BRAZE CUT

### 4WAY

**ONLY \$14.75**  
f.o.b. factory

### WELDER

Complete with Twin Carbon Arc Torch and accessories... to handle all metal-craft work.

Acclaimed by thousands of Homemakers, Mechanics and Hobbyists as the welder of 1001 uses. Easily operated from properly wired 110 volt AC or DC line. The ideal gift with a life-long use... Order today on 10 day money back guarantee.

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### Works Like Magic!

- Cleans hardened paint brushes... easily and thoroughly!
- Cleans all types of bristles
- Nonflammable... re-usable

At Paint and Hardware Stores Everywhere

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### Irwin Speedbor "88"

most revolutionary bit in years

• Irwin's Exclusive Hollow Ground Point and spade-type cutters bore faster, deeper, cleaner with less power. Try the Speedbor "88" in your small ¼" electric drill or drill press and see. Get smooth, effortless cutting action in hard or soft woods, plaster, plywood, plastics — even hardwood maple! Forged in one piece from solid bar of high carbon steel, hardened full length to stay sharp. And remember... the hollow ground point is exclusive with Irwin's Speedbor "88". Buy individual sizes or sets from your independent hardware dealer.

No. 886-R plastic roll set of 6, sizes ¼" to 1", only \$4.50

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- the original solid center auger bit
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G-1 160-250 amp, 30V, New \$12.95 used \$9.95  
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**V-BELT PULLEY KIT.** Fits R-1, P-1, G-1 & AC-DC generators; has 2 ball bearing blocks with high speed bearings, three grooves V pulley, Dr. shaft 1/2" long & flex coupling \$17.50

**AC-DC WELDER KIT** 2511 G.E. Generators  
Makes A.C. light plant & D.C. welder & battery charger, 1250 Watts A.C., & 200 Amps, 30V, D.C. incl., 2 Volt reg., 1 R.C. relay, 1 R.P.M. indicator, 1 electrode holder, 1 switch, 1 helmet, rheostat & instr. \$38.50

Kit as above with R-1 J. & Helms or G.E. 300 amp \$38.50. Kit with new 160-250 amp, gen. \$21.50. Kit with new G.E. 200 amp, gen. \$25.50.

**New Reactor Coil Air Stabilizer** with 24 S. Copper Wire, for R-1, P-1, G-1 & AC-DC, gen. \$24.50. Kit with 11 lbs. \$30.95.

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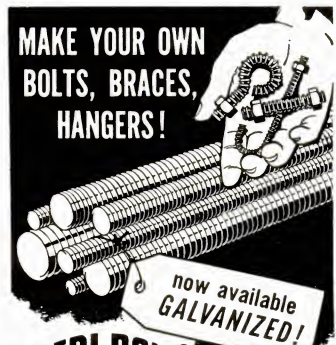
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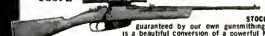
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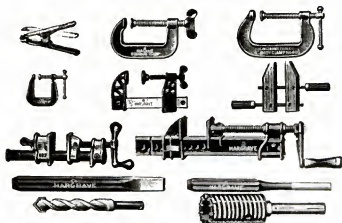
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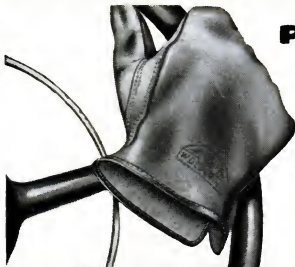
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Now anyone can make perfect cabinet finished stock from low-cost rough lumber... any size up to 12 1/4 inches wide and 6 inches thick. Turn out high grade finished material at a fraction of the cost you pay lumber yards. Big 42-inch planer makes it easy to plane heavy, wide and long pieces... BELSAW self-feeds at 14 to 34 feet per minute.

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## PAGE

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A tremendously powerful hydraulic press, capable of exerting 9,000 lbs. pressure. Pays for itself many times over—straightening bent connecting rods, king pins, crank shafts, axles, link pins and hubs—or pushing out of line bearings and bushings. Develops pressure under positive control and visible at all times on accurate gauge. Complete with both large and small anvils and dies to straighten any kind of curve or bend. (Item 443) Wt. 110 lb. Actual cost \$365. Our special **\$69.50**  
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A powerful cylinder mfr'd. by Massey Harris which develops both pushing and pulling action. Will push 8,100 lbs.—with a 1000 PSI pump pressure. Cylinder is 3 1/2" O.D. with 3/4" stroke—standard heavy duty clevis on both ends. Has standard 1 1/2" pipe thread openings. Can be used for fitting, bending, shearing, raising or lowering implements, hydraulic presses, etc. Can be used as an air cylinder. (Item 802) Wt. 17 **\$14.95**  
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8" stroke—3" bore..... **\$34.00**  
10" stroke—3" bore..... **\$44.00**  
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We have all sizes of cylinders in stock.

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—4 way open center valve with built-in adjustable relief. Controls 1 double, or 2 single acting cylinders. Equipping feature permits easy control even under heavy loads. 3/4" pipe thread on inlet & outlet. 1 1/2" on cylinder outlets. Easily finger tip control. Wt. 16 lbs. (Item 822) **\$21.95**  
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Connect or disconnect hydraulic lines without loss of oil. 1/2" pipe threads. (Item 819) per pair **\$3.95**  
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115 v. 60 cye. AC Powered by a rugged 2 1/2 HP Clinch's engine. No wiring necessary—just plug in and operate. Plenty of current for any oil burner, freezer, toaster, electric heater, etc. which require up to 700 watts. Item for television and radios. Complete with Voltmeter and plug in whirling to charge 6 v. auto batteries. Item 214. Wt. 75 lbs. Easily fits in car trunk. If prepared if storm knocks out power lines. Reg. \$275 value... **\$143.50**  
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**1200 Watt Plant** (Item 45) same as Item 24 but larger generator and engine **\$199.50**  
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## EXCLUSIVE! NEW! LIGHTWEIGHT WATER COOLED DIESEL GENERATOR PLANT

Never before available! Now offered exclusively by Master Mechanic's at low priced, lightweight, compact, diesel generator set. Powered by a super rugged, exceptionally smooth running, one-cylinder Diesel engine. Operates at outdoor diesel 1750 R.P.M., and delivers full 1750-2000 watts of power. Operates on low cost fuel oil. Wt. only 240 lbs. representing a triumph of Diesel Engineering. Complete with fuel filter, oil filter, air filter, gauge, control box with duplex recirculating oil pump. (Item 830) Special factory price..... **\$399.50**  
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Genuine Neoprene Hose—outlasts ordinary rubber 3 to 1. Reinforced with superior tough cotton piles—yet completely flexible. Equipped with a standard thread male and female fittings. Pump was used for pressing, jacking, stock tanks, home, etc.—or pump tank and fuel oil. Volume factor—prices—average less than 50¢ per ft.

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Size	Price	Size	Price
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1 1/2" x 20'	24.50	2" x 20'	49.50
1 1/2" x 30'	36.50	2" x 30'	74.50
1 1/2" x 40'	48.50	2" x 40'	99.50
1 1/2" x 50'	60.50	2" x 50'	124.50
1 1/2" x 60'	72.50	2" x 60'	149.50
1 1/2" x 75'	90.50	2" x 75'	184.50
1 1/2" x 90'	108.50	2" x 90'	219.50
1 1/2" x 105'	126.50	2" x 105'	254.50
1 1/2" x 120'	144.50	2" x 120'	289.50

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"PEXTO" Nine inch cutting blade made of special high carbon alloy steel, perfectly aligned and ground. Easily cuts steel plate up to 1/2" gauge or 1 1/2" thick. Overall length 40". Wt. 49.50 lbs. Item 145. Regular **\$149.50**. While they last..... **\$14.95**  
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## PORTABLE LIGHT PLANTS

**GIANT 2500 WATT PLANT**  
110-220/115/20 cye. AC. Absolutely best portable exclusive dynamo—fully equipped with armature; heavy wiring; develops up to 2500 watts—overload for motor starting, etc. mounted—portable. Powered by an easy starting Briggs or Wisconsin 6 HP engine. Complete with accessories; engine easily disconnected for other use. Electrically disconnected, no wiring necessary. Ample current for all purposes. Factory guaranteed. Item 31. Wt. 210 lbs. Reg. price \$319.50. Special at..... **\$299.50**  
Reg. \$319.50 value. Factory price.  
Same plant with electric generator only and control box..... **\$359.50**  
Reg. \$359.50 value. Factory price.  
of above models for \$25.00 additional.

## MASTER AIR COMPRESSOR

COMPARE! This is the only portable air compressor built with a **NUT RUST** painted body. Safe up to 500 lbs. Item 200 High pressure type. 2 1/2 c.f.m. large volume of air for heavy duty service. Item 201 Inflating truck & auto tires. Item 202 2 1/2 c.f.m. large volume of air for heavy duty service. Item 203 Inflating truck & auto tires. Item 204 2 1/2 c.f.m. large volume of air for heavy duty service. Item 205 Inflating truck & auto tires. Item 206 2 1/2 c.f.m. large volume of air for heavy duty service. Item 207 Inflating truck & auto tires. Item 208 2 1/2 c.f.m. large volume of air for heavy duty service. Item 209 Inflating truck & auto tires. Item 210 2 1/2 c.f.m. large volume of air for heavy duty service. Item 211 Inflating truck & auto tires. Item 212 2 1/2 c.f.m. large volume of air for heavy duty service. Item 213 Inflating truck & auto tires. Item 214 2 1/2 c.f.m. large volume of air for heavy duty service. Item 215 Inflating truck & auto tires. 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- ☐ Architecture
- ☐ Arch. Drawing and Designing
- ☐ Building Contractor
- ☐ Building Estimator
- ☐ Carpentry and Millwork
- ☐ Carpenter Foreman
- ☐ Heating
- ☐ Interior Decoration
- ☐ Painting Contractor
- ☐ Plumbing
- ☐ Reading Arch. Blueprints

### ART

- ☐ Commercial Art
- ☐ Magazine & Book Illus.
- ☐ Show Card and Sign Lettering
- ☐ Sketching and Painting

### AUTOMOTIVE

- ☐ Automobiles
- ☐ Auto Body Rebuilding and Refinishing
- ☐ Auto Engine Tuneup
- ☐ Auto Technician

### AVIATION

- ☐ Aero-Engineering Technology
- ☐ Aircraft & Engine Mechanic

### BUSINESS

- ☐ Accounting
- ☐ Advertising
- ☐ Business Administration
- ☐ Business Management
- ☐ Cost Accounting
- ☐ Creative Salesmanship
- ☐ Managing a Small Business
- ☐ Professional Secretary
- ☐ Public Accounting
- ☐ Purchasing Agent
- ☐ Salesmanship and Management
- ☐ Traffic Management

### CHEMICAL

- ☐ Analytical Chemistry
- ☐ Chemical Engineering
- ☐ Chem. Lab. Technician
- ☐ Elements of Nuclear Energy
- ☐ General Chemistry
- ☐ Natural Gas Prod. and Trans.
- ☐ Petroleum Prod. and Engr.
- ☐ Professional Engineer (Chem)
- ☐ Pulp and Paper Making

### CIVIL ENGINEERING

- ☐ Civil Engineering
- ☐ Construction Engineering
- ☐ Highway Engineering
- ☐ Professional Engineer (Civil)
- ☐ Reading Struc. Blueprints
- ☐ Structural Engineering
- ☐ Surveying and Mapping

### DRAFTING

- ☐ Aircraft Drafting
- ☐ Architectural Drafting
- ☐ Drafting Machine Design
- ☐ Electrical Drafting
- ☐ Mechanical Drafting
- ☐ Sheet Metal Drafting
- ☐ Structural Drafting

### ELECTRICAL

- ☐ Electrical Engineering
- ☐ Electrical Engr. Technician
- ☐ Elec. Light and Power
- ☐ Practical Electrician
- ☐ Practical Lineman
- ☐ Professional Engineer (Elec)

### HIGH SCHOOL

- ☐ High School Diploma

- ☐ Good English
- ☐ High School Mathematics
- ☐ Short Story Writing

### LEADERSHIP

- ☐ Industrial Foremanship
- ☐ Industrial Supervision
- ☐ Personnel-Labor Relations
- ☐ Supervision

### MECHANICAL AND SHOP

- ☐ Diesel Engines
- ☐ Gas-Elec. Welding
- ☐ Industrial Engineering
- ☐ Industrial Instrumentation
- ☐ Industrial Metallurgy
- ☐ Industrial Safety
- ☐ Machine Design
- ☐ Machine Shop Practice
- ☐ Mechanical Engineering
- ☐ Professional Engineer (Mech)
- ☐ Quality Control
- ☐ Reading Shop Blueprints
- ☐ Refrigeration and Air Conditioning
- ☐ Tool Design
- ☐ Tool Making

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- ☐ General Electronics Tech.

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